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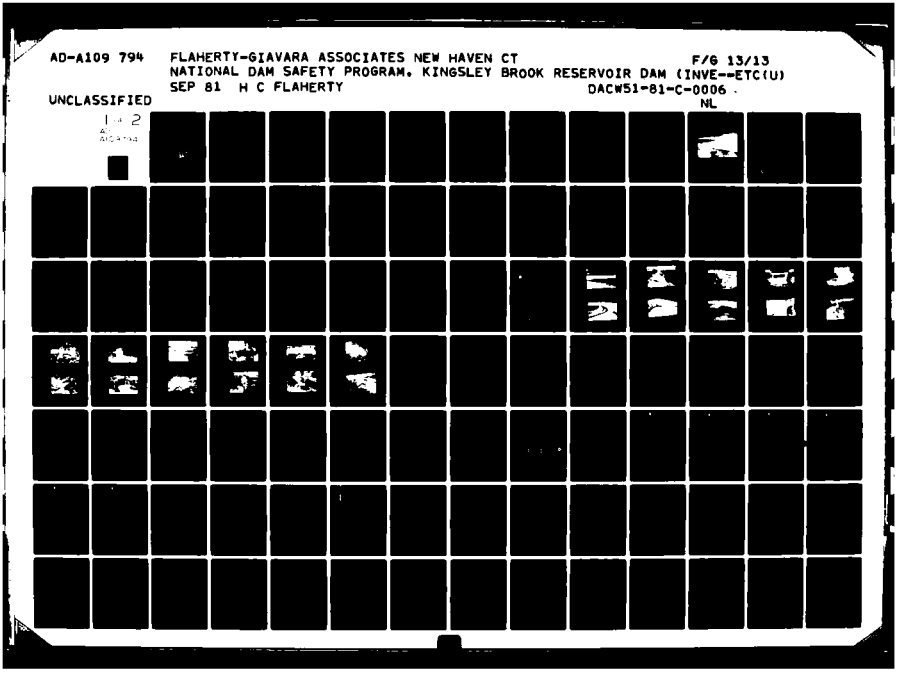

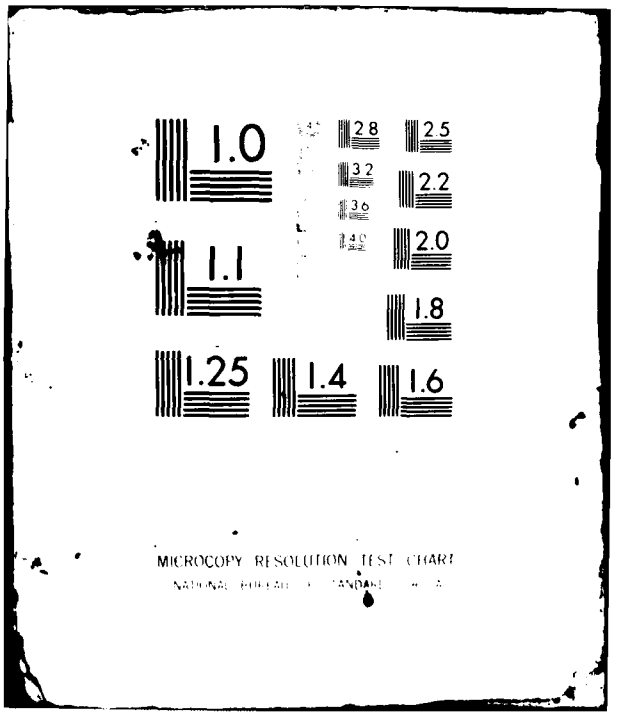
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LEVEL II

(1)

SUSQUEHANNA RIVER BASIN

KINGSLEY BROOK RESERVOIR DAM

MADISON COUNTY, NEW YORK
INVENTORY No. NY. 353

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

NEW YORK DISTRICT, CORPS OF ENGINEERS
JUNE 1981

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
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4. TITLE (and Subtitle) Phase I Inspection Report Kingsley Brook Reservoir Dam Susquehanna River Basin, Madison County, New York Inventory No. 353		5. TYPE OF REPORT & PERIOD COVERED Phase I Inspection Report National Dam Safety Program
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18. SUPPLEMENTARY NOTES

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Dam Safety
National Dam Safety Program
Phase I Inspection
Hydrology, Structural Stability

Kingsley Brook Reservoir Dam
Madison County
Susquehanna River Basin

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual examination of the dam by the performing organization.

Examination of available documents and visual inspections of the dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies that need to be evaluated and remedied.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Using the Corps of Engineers' screening criteria for the initial review of spillway adequacy, it has been determined that the embankment would be overtopped by all storms exceeding 21 percent of the Probable Maximum Flood (PMF). Dam overtopping, the resulting erosion of the embankment and hence, dam breaching would cause water surface levels downstream to reach depths which would pose significant danger to residents. Therefore, the spillway is adjudged to be seriously inadequate and the dam is assessed as unsafe, nonemergency.

The classification "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean that there appears to be a serious deficiency in spillway capacity and if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard to life downstream of the dam.

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
KINGSLEY BROOK RESERVOIR DAM
INVENTORY NO. NY 353
SUSQUEHANNA RIVER BASIN
MADISON COUNTY, NEW YORK

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APPENDICES

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Kingsley Brook Reservoir Dam
State Located:	New York
County:	Madison
Watershed:	Susquehanna River Basin
Watercourse:	Kingsley Brook
Dates of Inspection:	March 11 and 13, 1981

ASSESSMENT

Examination of available documents and visual inspections of the dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies that need to be evaluated and remedied.

Using the Corps of Engineers' screening criteria for the initial review of spillway adequacy, it has been determined that the embankment would be overtopped by all storms exceeding 21 percent of the Probable Maximum Flood (PMF). Dam overtopping, the resulting erosion of the embankment and hence, dam breaching would cause water surface levels downstream to reach depths which would pose significant danger to residents. Therefore, the spillway is adjudged to be seriously inadequate and the dam is assessed as unsafe, nonemergency.

The classification "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean that there appears to be a serious deficiency in spillway capacity and if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard to life downstream of the dam.

It is recommended that the following additional investigations be performed by a registered professional engineer engaged by the owner:

1. Conduct a detailed hydrologic and hydraulic analysis to more accurately determine the site specific characteristics of the watershed.

2. Lack of information regarding embankment materials, zoning and cutoffs hampered the dam assessment, particularly as it relates to embankment seepage; as a result, attempt to obtain further plans or details of embankment materials, zoning and cutoffs.

3. No water was observed discharging from any of the 6 inch diameter corrugated metal drain pipes installed in the crushed stone filter blanket; therefore, evaluate the effectiveness of the drainage blanket installed in 1979, particularly to:

   a. Determine if the filter fabric is plugged, clogged or otherwise ineffective in transmitting water.

   b. Determine the elevations of the toe drains to decide if they need to be relocated in plan or elevation to serve their intended function.

4. Two soft, wet areas were observed in low, relatively flat sections of ground at the downstream toe of slope below the drainage blanket; therefore, these seepage conditions should be monitored over at least 12 months and during periods of high reservoir levels to determine if the rates are increasing or if soil particles are being carried by the seepage.

5. If the seepage mentioned in Item 4 above is found to be continuous and the rates increasing or if erosion is occurring, evaluate the source and cause of the seepage, (i.e., through the foundation or through the embankment) and determine what remedial measures may be required (i.e., lower or modify the toe drain details of the present system, or provide a completely different system). To accomplish this task it may be necessary to conduct a test boring program to determine the data noted in Item 1 above, if such data is not otherwise available.

6. Several earthen slumps have occurred above the drainage blanket in the vicinity of the left abutment; therefore, monitor the left downstream abutment area for continued slumping.

It is recommended that within 3 months of the final approval date of this report, all of the additional investigations should be initiated and within 18 months, appropriate remedial measures should be completed. In the interim, a plan for providing around-theclock surveillance of the dam during periods of unusually heavy precipitation should be developed and implemented.

The following remedial measures should be completed within 12 months to correct existing deficiencies:

1. Repair the emergency spillway to prevent continuing seepage.

2. Grade, reseed and mulch the channel embankment side slopes immediately downstream and to the left of the emergency spillway.

3. Remove the logjam located in the emergency spillway discharge channel.

4. Flatten the top of the upstream and downstream slopes to prevent future slumping.

5. All tree stumps over 6 inches in diameter on the embankment slopes should be removed and the areas backfilled.

6. Cut the brush and grass on the embankment slopes and spillway channel bottom at intervals of one to two years to prevent their becoming overgrown.

7. Fill in any animal burrows on the embankment slopes.

8. Develop and implement a flood warning and emergency evacuation plan to alert downstream residents in the event conditions occur which could result in failure of the dam.

Submitted by: FLAHERTY GIAVARA ASSOCIATES, P.C.

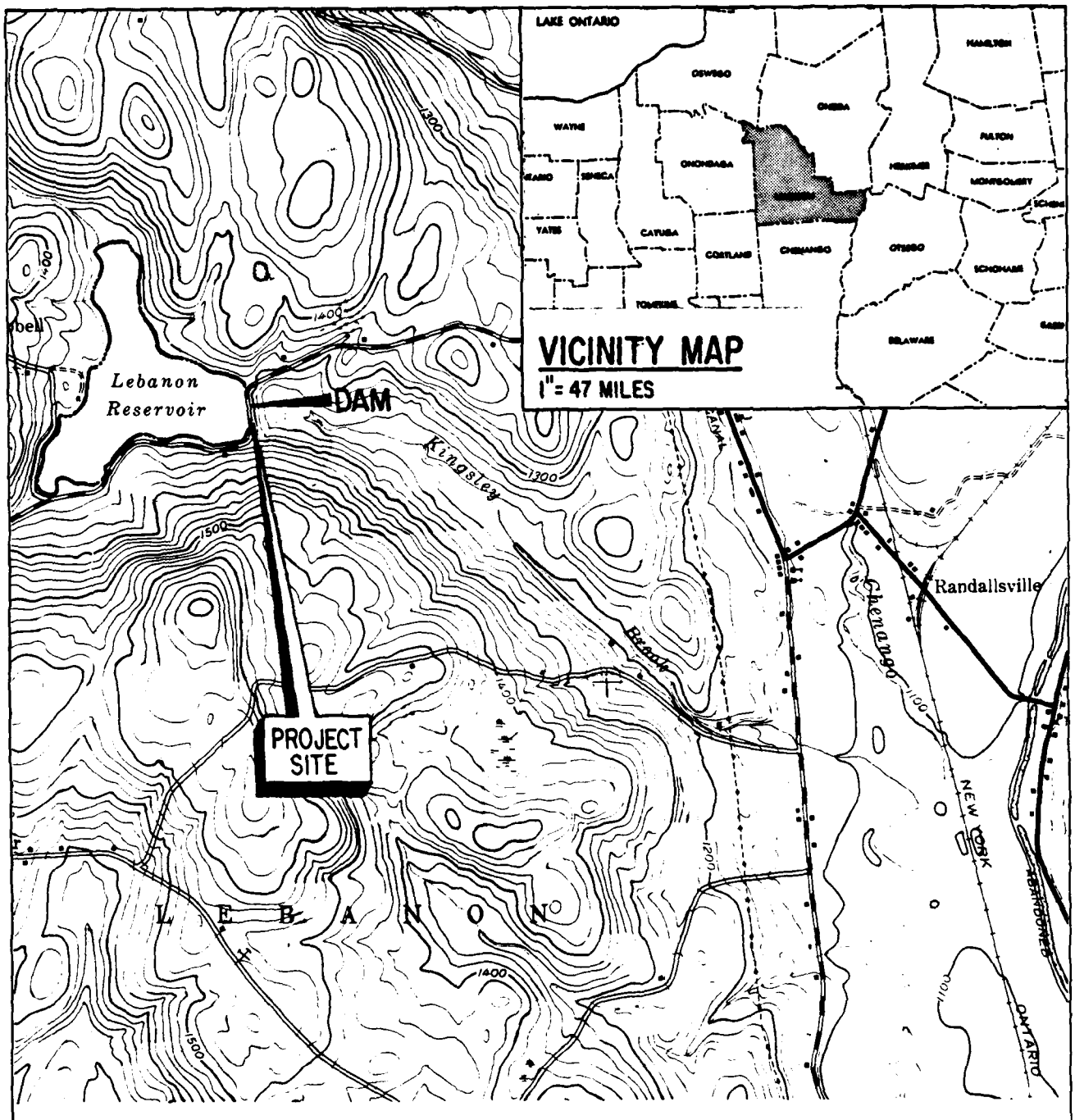
Hugh C. Flaherty, P.E. & L.S.
Chairman of the Board
New York License No. 38508

Approved by:

Col. W. M. Smith, Jr.
New York District Engineer

Date: 15 Sep 81

PHOTO #1: Overview of
Kingsley Brook Reservoir Dam
Inventory No. NY 353



LOCATION MAP

KINGSLEY BROOK RESERVOIR DAM
INVENTORY No. NY 353

SUSQUEHANNA RIVER BASIN
MADISON COUNTY
LEBANON, NEW YORK

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SCALE IN FEET

FLAHERTY · GIAVARA ASSOCIATES, P.C.

NATIONAL DAM SAFETY PROGRAM
PHASE I INSPECTION REPORT
KINGSLEY BROOK RESERVOIR DAM
INVENTORY NO. NY 353
D.E.C. NO. 104D-698
SUSQUEHANNA RIVER BASIN
MADISON COUNTY, NEW YORK

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Phase I Inspection reported herein was authorized by the Department of the Army, New York District, Corps of Engineers, to fulfill the requirements of the National Dam Inspection Act, Public Law 92-367. Flaherty Giavara Associates, P.C. has been retained by the New York District to inspect and report on selected dams in the State of New York. Authorization and notice to proceed was issued to Flaherty Giavara Associates, P.C. under a letter of December 24, 1980 from W. M. Smith Jr., Colonel, Corps of Engineers. Contract No. DACW 51-81-C-0006 has been assigned by the Corps of Engineers for this work.

b. Purpose

Evaluation of the existing conditions of the subject dam to identify deficiencies and hazardous conditions, determine if they constitute hazards to life and property and recommend remedial measures where necessary.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

Kingsley Brook Reservoir Dam consists of an earthen embankment with an elliptical cut stone masonry tunnel principal spillway under the central portion of the embankment and a cut stone masonry emergency spillway near the right abutment. Profiles and sections prepared by the State of New York Department of Transportation (DOT) for the dam as it existed in 1978 are included on drawings in Appendix G.

The dam embankment is 900 feet long and a maximum of 63 feet high. The downstream slopes vary from 4 horizontal to 1 vertical over the bottom half to 3 to 1 over the upper half. The top 5 to 6 feet of the downstream and the upstream slopes (above reservoir level) are approx-

imately 1.5 to 1. A two lane paved town highway runs along the crest of the dam, which has an overall width of 20 feet. The upstream slope above the reservoir level has flat platy riprap for slope protection while the upper half of the downstream slope has grass for erosion protection. Due to downstream embankment seepage conditions observed by DOT in 1976 and 1977, remedial treatment of the lower half of the downstream slope was undertaken in 1979. This treatment consisted of placing a layer of filter fabric over approximately the lower half of the existing slope and covering the fabric with 2 feet of crushed stone. The filter fabric and stone were extended 20 to 40 feet beyond the toe of slope. Six inch diameter perforated corrugated metal toe drains were incorporated into the stone near the toe of slope. The toe drain to the right of the principal spillway slopes toward and discharges into the principal spillway discharge conveyance channel just downstream and to the right of the tunnel outlet. The toe drains to the left of the principal spillway slope toward a low point in the downstream toe near the left abutment and discharge into a ditch which also drains into the principal spillway discharge conveyance channel.

The principal spillway is a 7 foot high by 4 foot wide elliptical cut stone masonry tunnel. Flow into the tunnel is controlled by gate valves on four 8 inch cast iron pipes.

The emergency spillway is a 16 foot wide cut stone masonry weir with mortared joints. The emergency spillway discharge conveyance channel is excavated into earth and rock near the right abutment. It runs perpendicular to the dam for about 200 feet then gradually curves to the left and discharges into Kingsley Brook.

b. Location

The Kingsley Brook Reservoir Dam is located on Reservoir Road approximately 4.3 miles west of the Village of Hamilton in the Town of Lebanon, New York. The dam is located at latitude north 42°-48.1' and longitude west 75°-36.1' on the U.S. Geological Survey 7.5 minute series topographic map "Hamilton, New York". The Location Map on page i indicates where the dam is situated.

c. Size Classification

The maximum height of the dam is 63 feet and the maximum storage capacity is 2260 acre-feet. Therefore, Kingsley Brook Reservoir Dam is classified as an "Intermediate" dam as defined by the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification

There are two major roads, approximately 1 dwelling and high voltage transmission lines within the dam failure flood hazard area. Therefore, the dam is in the "High" hazard category as defined by the Recommended Guidelines for Safety Inspection of Dams.

e. Ownership

The dam is owned by the State of New York - Department of Transportation (DOT), Waterways Maintenance Division. It is located in DOT Region 2, whose headquarters is in Utica. The addresses and telephone numbers of the Main Office and the Regional Office are as follows:

Owner

Contact: Mr. Joseph R. Stellato, Director
State of New York
Department of Transportation
Main Office - State Campus
1220 Washington Avenue
Albany, New York 12232

Telephone: (518) 457-4407

Mr. Frank W. Jennings, Regional
Waterways Maintenance Engineer
Region 2 Office
State of New York
Department of Transportation
Utica Office Building
207 Genesee Street
Utica, New York 13501

Telephone: (315) 797-6120 Ext. 2443

f. Purpose

The dam was originally constructed to feed the summit level of the Chenango Canal north of Hamilton. Then, under Chapter 404, Laws of 1877, the Chenango Canal was abandoned, but the reservoir system and the feeder canals were retained to feed the enlarged Erie Canal. Reservoir water flowed north through a five mile section of the old Chenango Canal and then dropped into Oriskany Creek at Solsville where it naturally flowed north to the Erie Canal or Mohawk River near Utica, New York.

Due to a breach in one of the feeder canals, water from Lebanon or Kingsley Brook Reservoir, its original name, no longer flows north. Instead it flows into the Chenan-

go River and south to the Susquehanna River.

Presently, there is a New York State Department of Environmental Conservation launch site for small boats at the southwest end of the reservoir and a private campground with 175 sites along the north shore. Consequently, its only current use is to maintain the level of the reservoir for recreational purposes.

g. Design and Construction History

The dam was constructed in 1835; however, in April 1843, the dam was badly damaged by a flood. Since the canal commissioners believed this water source was unnecessary, it was not repaired at this time. By 1862, additional water was needed for the Chenango Canal and in 1864, reconstruction of Kingsley Brook Reservoir Dam was begun. However, due to a scarcity of labor and a change in plans, reconstruction was not completed until 1867. The dam was originally designed to be twice as high as it was built in 1835 or 14 feet higher than its constructed flow line. When reconstruction began, plans called for repairs only to the breaches, but later it was deemed economical to raise the dam to its designed height. For a small increase in cost, the reservoir capacity was doubled.

In July 1952, four new 8 inch diameter flanged gate valves were installed on the cast iron pipes in the gate chamber of the principal spillway.

The only other major post construction modification noted was the installation of a filter membrane, toe drains and a blanket of crushed stone over wet areas in 1979 by the C. D. Murray Company of Syracuse, New York. Contract drawings prepared for these improvements are included in Appendix G.

h. Normal Operating Procedure

The water level in the reservoir is recorded once a week. The gate valves are opened or closed as required to maintain a normal water level in the reservoir approximately equal to the emergency spillway crest elevation of 1311.0 (NGVD).

1.3 PERTINENT DATA

a.	Drainage Area (Square Miles)	5.21

b. Discharge at Dam Site (CFS)

- Top of Dam	671
- Crest of Emergency Spillway	47
- Inlet to Principal Spillway	-
- Reservoir Drain Inlet	-

c. Elevations (NGVD - estimated)

- Top of Dam	1317.0
- Crest of Emergency Spillway	1311.0
- Inlet to Principal Spillway	1262.8±
- Reservoir Drain Inlet	1262.8±

d. Reservoir Surface Area (Acres)

- Top of Dam	113
- Crest of Emergency Spillway	95
- Inlet to Principal Spillway	-

e. Storage (Acre-Feet)

- Top of Dam	2260
- Crest of Emergency Spillway	1640
- Inlet to Principal Spillway	-

f. Dam

- Type: Gravel and earthfill	
- Length (Feet)	900
- Upstream Slope (H:V)	1.5:1
- Downstream Slope (H:V)	3-4:1
- Crest Width (Feet)	20

g. Emergency Spillway

- Type: Cut stone masonry weir and an excavated earthen and bedrock channel	
- Length (Feet)	
weir	16
channel	1200±
- Bottom Width (Feet)	
weir	5.5
channel	12
- Side Slopes (H:V)	
weir	vertical
channel	2:1
- Channel Bottom Slopes (Feet/Foot)	
upstream	-
downstream	0.072
- Control: None	

h. Principal Spillway

- Type: 7 foot high by 4 foot wide elliptical cut stone masonry tunnel (320 feet long) having four 8 inch diameter gated inlet pipes discharging into it and a discharge conveyance channel

- Control: Four 8 inch gate valves

i. Reservoir Drain

- Type: The elevations of the four 8 inch diameter cast iron pipes of the principal spillway are such that the pipes also serve as the reservoir drain

- Control: Four 8 inch gate valves

SECTION 2 - ENGINEERING DATA

2.1 GEOTECHNICAL DATA

a. Geology

The Kingsley Brook Reservoir Dam is located on Kingsley Brook, a southeasterly flowing tributary to the Chenango River, about 4.3 miles west of the Village of Hamilton in the Allegheny Plateau physiographic province of New York State.

The topography in the area ranges from elevation 1240 in the streambed downstream of the dam to elevation 1700 atop the hill immediately south of the dam.

Bedrock in the vicinity of the site consists of the Skaneateles Formation, belonging to the Middle Devonian Hamilton group. Bedrock exposed at the site probably belongs to the Chenango Sandstone member of the Skaneateles Formation, a medium to thick, cross-bedded gray to buff weathered silty sandstone, with occasional fossils and ripple marks. This unit was deposited in a shallow, near-shore setting of the Catskill Delta complex that prograded across the state approximately from east to west.

Above the bedrock, some or all of the valley bottom may be mantled with glacial till, a heterogeneous mixture of clay, silt, sand, gravel and cobbles, deposited at the base of ice sheets which once covered the region. This in turn may be overlain by well-sorted sands and gravels deposited first by glacial meltwater streams and later by Eaton Brook and subsidiary tributary streams.

b. Subsurface Conditions

It was noted on an inspection report made in 1917, that the character of the foundation material for the spillway and the embankment was "gravel". No known subsurface explorations were made at the site, other than the test pits dug in 1978. Logs of these test pits are included in Appendix G.

2.2 DAM AND APPURTENANT STRUCTURES

No records were obtained concerning the original design of the dam; however, some information which was used for the design of the filter blanket on the downstream slope is included in Appendix G.

2.3 CONSTRUCTION RECORDS

This dam was constructed in 1835. The contract drawings prepared for the modifications done in 1979 by the New York State Department of Transportation - Design and Construction Division are also included in Appendix G.

2.4 OPERATION RECORDS

Reservoir water level readings are taken weekly. Records are kept at the Regional Waterways Maintenance Office in Utica, New York.

2.5 EVALUATION OF DATA

The data presented herein was obtained primarily from the Region 2 Office of the New York State Department of Transportation (DOT) located in Utica, New York and also from the files of the New York State Department of Environmental Conservation (DEC). This information appears to be reliable and adequate for the purposes of a Phase I Inspection Report.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspections of the Kingsley Brook Reservoir Dam were conducted on March 11 and 13, 1981. The weather was mostly overcast and the temperature was 35±°F. At the time of the inspection, there were small patches of snow on the ground and water was flowing in the principal spillway (See Photo No. 14).

b. Dam

The earthfill embankment of the dam is generally in fair condition (See Photos No. 4, 5, 6 and 7). Reservoir Road runs along the dam crest which is in good condition (See Photo No. 3). There was no visible evidence of lateral movement, settlement, erosion or other serious defects. However, there is concern relative to seepage conditions at the downstream toe of slope.

The following specific items were noted:

1. Two soft wet areas were observed in low, relatively flat sections of ground downstream of the crushed stone drainage blanket. One area extends from about 70 feet to the right of the principal spillway outlet pipe to the gently rising ground leading to the right abutment (See Photos No. 16 and 17). The other area occurs in the vicinity of the intersection of the downstream toe and the left abutment. Both of these areas were blanketed with matted-down marsh grass. Beneath the grass the ground was very soft and spongy. Occasional silt boils about 3 to 4 inches in diameter were noted in the wet area to the right of the principal spillway discharge channel (See Photo No. 18). Animal burrow channels about 2 inches in diameter criss-crossed the ground beneath the matted grass in both wet areas. Silty water was observed flowing in these channels (See Photo No. 22). No seepage was observed discharging from the stone into these areas; however, where visible, it appeared that the seepage was coming from between the original ground and the bottom of the filter fabric (See Photo No. 21).

2. No water was observed discharging from any of the 6 inch diameter corrugated metal drain pipes installed in the stone drainage blanket (See Photos No. 20 and 23). In fact, the outlets of the drain pipes appeared to be at higher elevations than the wet ground

they are purported to be draining. At the left abutment area, the outlets for the toe drains were noted to be 6 to 12 inches above ground and seepage was observed coming from beneath the filter fabric at the toe of the drainage blanket under the toe drains (See Photo No. 20).

3. Water was noted in the drainage ditches which were constructed to convey the toe drain discharges to the principal spillway discharge conveyance channel (See Photo No. 19). However, it appears this water is from the wet areas.

4. The upstream riprapped slope was covered with grass and brush, and scattered 3 inch diameter tree or brush stumps were observed between the riprap (See Photos No. 4 and 6). These stumps had been cut off within the past several years.

5. Several earth slumps (5 to 10 feet in diameter) were noted to have occurred at some time in the past above the crushed stone drainage blanket in the vicinity of the left abutment area. Apparently additional slumps had been observed by DOT in the late 1970's, but these areas were covered by the crushed stone drainage blanket in 1979. No slumping of the stone was noted.

6. Occasional minor sloughs (approximately 12 inches in diameter) were noted in the top few feet of the upstream and downstream slopes. These slopes are 1 to 1.5 horizontal to 1 vertical just below the crest, and appear to have resulted from gravel pushed out to widen the crest during roadway grading operations.

7. Occasional cut-off tree stumps similar to those on the upstream slope were noted in the top 5 to 6 feet of the downstream slope.

8. The crest of the dam appear to be about 6± inches lower in the center than at the ends.

c. Principal Spillway

The principal spillway consists of a submerged intake structure, four gated 8 inch diameter cast iron pipes discharging into a 7 foot high by 4 foot wide elliptical cut stone masonry tunnel and a discharge conveyance channel (See Photo No. 15). The gate to the tunnel was locked; therefore, the intake pipes were not observed or operated.

d. Emergency Spillway

This broad-crested weir is constructed of cut stone masonry and has a width of 16 feet which is spanned by a concrete bridge (See Photo No. 8). It is in fair condition showing some signs of deterioration. Downstream of the weir is a discharge channel excavated into earth and bedrock (See Photo No. 11).

The following observations were made:

1. Slight seepage through the joints of the cut stone masonry on the downstream left side of the spillway weir was observed (See Photos No. 9 and 10).

2. A logjam of debris has formed in the discharge channel (See Photo No. 12).

3. The left side slope of the discharge channel downstream of the logjam is severely eroded (See Photo No. 13).

4. Minor irregular sloughing was noted on the side slopes of the spillway discharge channel.

5. Small (1± inch diameter) animal burrows were observed on the left channel side slope immediately downstream of the spillway weir. No vegetative cover existed on the slope in this area and some very minor erosion was noted.

e. Downstream Channel

The natural channel downstream of the dam is located beyond the principal spillway discharge conveyance channel. It has a width of 10 feet and a depth of 12 inches (See Photo No. 15).

f. Reservoir - Storage Pool Area

The reservoir area is bordered by moderately sloping woodlands (See Photo No. 2). There does not appear to be any significant probability of landslides into the storage pool affecting the safety of the dam.

3.2 EVALUATION OF OBSERVATIONS

The visual inspections revealed several deficiencies on this structure. The following items were noted:

a. Two soft wet areas having small silt boils were observed beyond the downstream toe of slope.

b. No water was discharging from any of the crushed stone filter blanket drains; the water appeared to be coming from beneath the filter blanket.

c. Seepage through the joints of the emergency spillway weir was noted.

d. A logjam was observed in the discharge channel of the emergency spillway.

e. Severe erosion was noted along the left side slope of the emergency spillway.

f. Water was observed in the drainage ditches for the toe drain discharges.

g. Several earthen sloughs of the downstream slope were in evidence.

h. Scattered 3 inch diameter tree or brush stumps covered the upper portions of the upstream and downstream slopes.

i. Occasional minor sloughs were noted within a few feet of the crest on the upstream and downstream slopes.

j. The crest of the dam appeared to be slightly lower in the center.

k. Minor, irregular sloughing was evident on the side slopes of the emergency spillway discharge channel.

l. Small animal burrows and minor erosion were observed on the left side slope of the emergency spillway discharge channel.

SECTION 4 - OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

The normal water surface level is maintained by the crest of the spillway weir at elevation 1311.0 (NGVD). The following operational procedures are in effect at this time:

a. The reservoir water level is recorded once weekly.

b. The valves of the principal spillway are opened to a minimum setting (three full turns of one valve) or adjusted as required to maintain a normal water level at or near the emergency spillway crest elevation of 1311.0 (NGVD).

4.2 MAINTENANCE OF DAM

Maintenance operations performed by the Regional Waterways Maintenance Office of the New York State Department of Transportation include:

a. Mowing the dam embankment annually.

b. Exercising the valves of the principal spillway for a full run and greasing them at least once a year.

c. Inspecting the emergency spillway annually and the dam once every two years.

4.3 WARNING SYSTEM

No warning system is presently in effect.

4.4 EVALUATION

Presently, the operation and maintenance procedures in effect for this dam are satisfactory. However, increased maintenance efforts are required to correct the deficiencies which now exist.

SECTION 5 - HYDROLOGIC/HYDRAULIC

5.1 DRAINAGE AREA CHARACTERISTICS

The dam is located in the Town of Lebanon on Kingsley Brook, approximately 11,600 feet upstream of the Chenango River. Kingsley Brook joins the Chenango River at the Village of Randallsville, approximately sixty-eight miles upstream of the Susquehanna River at Binghamton, New York.

The watershed (shown on the Watershed Map on Page C-5 in Appendix C) consists of 3,332 acres (5.21 square miles) of rolling to hilly uplands with typical slopes of 10 percent. It is comprised of two distinct subwatersheds, one being 1,210 acres and the other, 2,122 acres, and was treated as such for the hydrologic analysis. Land within the watershed is primarily agricultural with extensive open fields. Seymour Pond which has a surface area of 11± acres is located approximately one mile upstream of the dam.

The watercourse upon which the reservoir is located, is a small perennial stream with a typical flow width of 10 feet and a typical flow depth of 12 inches.

5.2 ANALYSIS CRITERIA

The purpose of the hydrologic/hydraulic analysis is to evaluate the spillway capacity and the potential for overtopping. The analysis of the spillway capacity of the dam and storage of the reservoir was performed using the Corps of Engineers' HEC-1 Computer Model - Dam Safety Version. The procedure included determining the Probable Maximum Flood (PMF) runoff from the watershed and routing the inflow hydrograph through the impoundment to determine the outflow hydrograph. The unit hydrograph was defined by the Snyder Synthetic Unit Hydrograph method, and the Modified Puls routing procedure was incorporated.

The initial rainfall loss was assumed to be 1.0 inches, and the uniform rainfall loss was assumed to be 0.1 inches per hour. In accordance with recommended guidelines of the Corps of Engineers, the Probable Maximum Precipitation (PMP) was 20.0 inches (24 hour duration, 200 square mile area).

The analysis was conducted for both the full PMF and for several fractional PMF conditions. The PMF inflow of 9,422 CFS was routed through the reservoir and the peak outflow was determined to be 9,422 CFS.

5.3 SPILLWAY CAPACITY

The total outlet capacity is the sum of the discharges from the principal spillway and the emergency spillway. However,

for the purpose of this analysis and to be conservative, it was assumed the gate valves of the principal spillway were in the closed position.

The principal spillway consists of a 7 foot high by 4 foot wide elliptical cut stone masonry tunnel and into which four 8 inch diameter gated inlet pipes discharge.

The emergency spillway consists of a cut stone masonry weir and an excavated earthen and bedrock channel.

The stage discharge data for the emergency spillway was calculated for the stages tabulated below:

Stage (Feet)	Discharge Capacity (CFS)	Element of Structure
1311.0	0	Emergency Spillway Crest
1312.0	48	--
1313.0	136	--
1314.0	249	--
1315.0	384	--
1315.5	458	Bottom of Bridge
1316.0	574	--
1317.0	671	Top of Dam

The total spillway capacity at the top of dam is 671 CFS.

5.4 RESERVOIR CAPACITY

The storage capacity of the reservoir was calculated for the stages indicated below:

Stage (Feet)	Storage (Acre-Feet)	Storage (Inches of Runoff)
1311.0	1640	5.91
1317.0	2260	8.14

5.5 FLOODS OF RECORD

No data regarding flood levels was obtained for this dam; however, in April 1843, the original dam was badly damaged by a flood.

5.6 OVERTOPPING POTENTIAL

The results of the HEC-1 DB computer analysis indicate that the crest of the dam is overtopped by all storms exceeding 21 percent of the PMF event. The PMF discharge rate of 9,422 cubic feet per second (CFS) would occur at a peak flood stage of 1318.6 feet, which is 1.6 feet above the crest of the dam.

The results of the analysis are tabulated below:

Flood Condition	Peak Inflow (CFS)	Peak Outflow (CFS)	Maximum Stage Elevation (NGVD)
0.5 PMF	4711	4688	1317.9
1.0 PMF	9422	9422	1318.6

5.7 EVALUATION

Using the Corps of Engineers' screening criteria for the initial review of spillway adequacy, it has been determined that the capacity of the emergency spillway is not adequate to pass one half the PMF; only approximately 21 percent of the PMF can be safely passed before overtopping will occur (assuming the worst condition). The PMF event would overtop the dam for a duration of 16 hours and the maximum depth of flow over the crest would be 1.6 feet. It is estimated that breaching of the dam as a result of overtopping, would cause water surface levels downstream to reach depths which would pose significant danger to residents. Therefore, the spillway is adjudged to be seriously inadequate and the dam is assessed as unsafe, nonemergency.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

There was no visible evidence of major settlement, lateral movement or other signs of overall structural instability of the dam during the site examination. Based on the conditions that were observed, there would be no reason to question the static structural stability of the dam in the absence of seepage. However, future observations and analyses are required to assess the severity of the observed seepage and to evaluate its impact on embankment stability.

b. Design and Construction Data

No information was obtained concerning the original design or construction of this dam. However, the drawings for the 1979 modifications entitled "Contract 95846 for Corrective Work at Eaton Brook Reservoir, Town of Eaton and Kingsley Brook Reservoir, Town of Lebanon, Madison County" are included in Appendix G and show a configuration for the embankment and discharge channel that generally corresponds to the conditions observed on March 11 and 13, 1981.

There is no construction data to confirm the actual physical properties and configuration of the earthfill in the embankment. However, the dam proportions are considered to be reasonable for the soils that were available at the site and the dam would be expected to have adequate safety margins with respect to stability under static loading conditions, provided the seepage conditions are adequately controlled.

c. Operating Records

Reservoir water level readings are taken weekly by the Regional Waterways Maintenance Office of the New York State Department of Transportation. Records are kept at their office in Utica, New York.

d. Post Construction Changes

Post construction changes include the installation of four new 8 inch diameter flanged gate valves on the cast iron pipes in the gate chamber of the principal spillway in July 1952 and the installation of toe drains, a filter membrane and a blanket of crushed stone over wet areas in 1979.

6.2 STRUCTURAL STABILITY ANALYSIS

Field sketches provide the cross section data of the emergency spillway. This cross section was evaluated for various loading conditions assuming a homogeneity of action of the mortared stone wall.

The stability analysis is presented in Appendix E. The results of the stability computations are summarized in the following table:

Loading Condition (Spillway Section)	[1]Factors of Safety: Overturning	[2]Sliding	[3]Location of Resultant Passing Through Base
1. Normal operating condition: water level at 1 foot above spillway crest	0.88	1.16	*
2. Maximum operating condition: water level at top of dam (6.0 feet above spillway crest)	0.33	0.54	*
3. 0.5 PMF condition: water level at El. 1317.9 (6.9 feet above spillway crest)	0.28	0.49	*
4. Ice loading condition: 5.0 Kips per foot acting at top of spillway	0.23	0.32	*

[1]These factors of safety indicate the ratio of moments resisting overturning to those moments causing overturning, and the ratio of forces resisting sliding to those causing sliding.

[2]As determined applying the friction-shear method

[3]Indicated in terms of the base dimension of the dam (b), measured from the toe of the dam

*Location of resultant falls outside of the spillway width

Note: All loading conditions include an uplift force equal to 2/3 the height of the emergency spillway multiplied by the hydrostatic pressure acting upon it which was applied in conjunction with all overturning and sliding forces.

According to the available history of operation, the water level is maintained at the normal operating condition by use of the principal spillway. As shown by the above table, the hydrostatic pressures against this stone masonry weir are greater than the cross section can sustain with an acceptable factor of safety. This fact is also collaborated by the seepage of water through this stone masonry cross section. Continued mortar failure and seepage of water through the wall will have a deliterious effect on the structural stability of this emergency spillway weir.

The Kingsley Brook Reservoir Dam is located in Seismic Zone 2. However, since there was not enough data available to determine the parameters of the embankment materials, it was not possible to perform a seismic stability analysis.

SECTION 7 - ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Condition

On the basis of the visual examinations, Kingsley Brook Reservoir Dam is considered to be in fair condition. There were no signs of impending structural failure or other conditions which would warrant urgent remedial action; however, there is uncertainty with regard to the cause and magnitude of seepage emanating from the dam.

b. Adequacy of Information

The evaluation of this dam is based primarily on visual examination, reference to available plans, approximate hydraulic and hydrologic computations, and application of engineering judgement. No information was available on the materials used to construct the embankment, the zoning or the cutoff. Lack of this information hampered the assessment of this dam, particularly as it related to embankment seepage. However, the available information that was obtained is adequate for the purposes of a Phase I assessment.

c. Need for Additional Investigations

It is recommended that the following additional investigations be performed by a registered professional engineer engaged by the owner:

1. Conduct a detailed hydrologic and hydraulic analysis to more accurately determine the site specific characteristics of the watershed.

2. Lack of information regarding embankment materials, zoning and cutoffs hampered the dam assessment, particularly as it relates to embankment seepage; as a result, attempt to obtain further plans or details of embankment materials, zoning and cutoffs.

3. No water was observed discharging from any of the 6 inch diameter corrugated metal drain pipes installed in the crushed stone filter blanket; therefore, evaluate the effectiveness of the drainage blanket installed in 1979, particularly to:

   a) Determine if the filter fabric is plugged, clogged or otherwise ineffective in transmitting water.

b) Determine the elevations of the toe drains to decide if they need to be relocated in plan or elevation to serve their intended function.

4. Two soft, wet areas were observed in low, relatively flat sections of ground at the downstream toe of slope below the drainage blanket; therefore, these seepage conditions should be monitored over at least 12 months and during periods of high reservoir levels to determine if the rates are increasing or if soil particles are being carried by the seepage.

5. If the seepage mentioned in Item 4 above is found to be continuous and the rates increasing, or if erosion is occurring, evaluate the source and cause of the seepage, (i.e., through the foundation or through the embankment) and determine what remedial measures may be required (i.e., lower or modify the toe drain details of the present system, or provide a completely different system). To accomplish this task, it may be necessary to conduct a test boring program to determine the data noted in Item 2 above, if such data is not otherwise available.

6. Several earthen slumps have occurred above the drainage blanket in the vicinity of the left abutment; therefore, monitor the left downstream abutment area for continued slumping.

d. Urgency

It is recommended that within 3 months of the final approval date of this report, all of the additional investigations should be initiated and within 18 months, appropriate remedial measures should be completed. In the interim, a plan for providing around-the-clock surveillance during periods of unusually heavy precipitation should be developed and implemented. The recommended corrective measures presented in Section 7.2 should be accomplished within 12 months of final approval.

7.2 RECOMMENDED MEASURES

It is considered important that the following items be accomplished in addition to any items required as a result of the additional investigations recommended in Section 7.1c:

a. Repair the emergency spillway to prevent continuing seepage.

b. Grade, reseed and mulch the channel embankment side slopes immediately downstream and to the left of the emergency spillway.

c. Remove the logjam located in the emergency spillway discharge channel.

d. Flatten the top of the upstream and downstream slopes to prevent future slumping.

e. All tree stumps over 6 inches in diameter on the embankment slopes should be removed and the areas backfilled.

f. Cut the brush and grass on the embankment slopes and spillway channel bottom at intervals of one to two years to prevent their becoming overgrown.

g. Fill in any animal burrows on the embankment slopes.

h. Develop and implement a flood warning and emergency evacuation plan to alert downstream residents in the event conditions occur which could result in the failure of the dam.

APPENDIX A

PHOTOGRAPHS

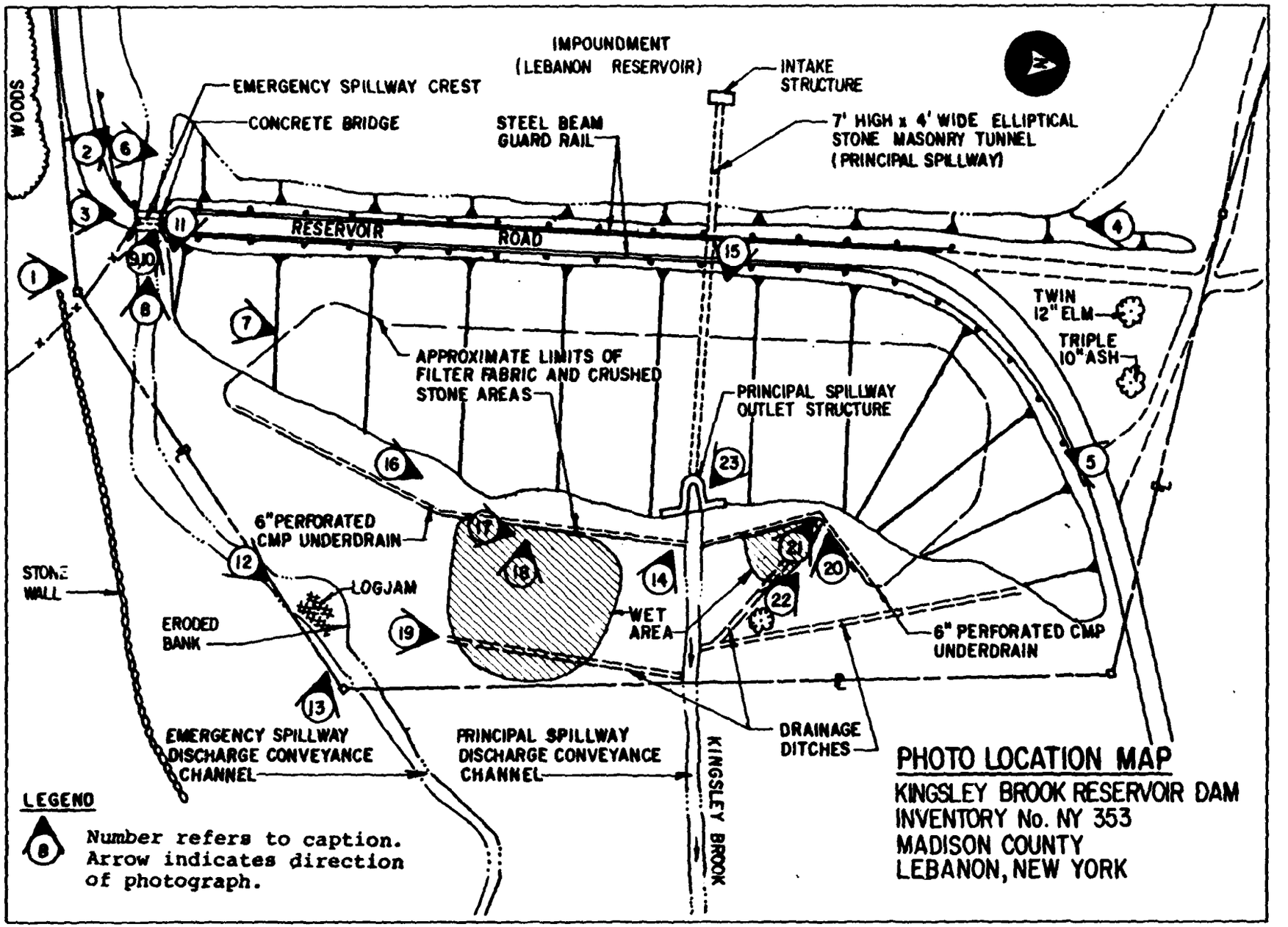

IMPOUNDMENT
(LEBANON RESERVOIR)
INTAKE STRUCTURE
EMERGENCY SPILLWAY CREST
CONCRETE BRIDGE
STEEL BEAM GUARD RAIL
7' HIGH x 4' WIDE ELLIPTICAL STONE MASONRY TUNNEL (PRINCIPAL SPILLWAY)
WOODS
RESERVOIR ROAD
TWIN 12" ELM
TRIPLE 10" ASH
APPROXIMATE LIMITS OF FILTER FABRIC AND CRUSHED STONE AREAS
PRINCIPAL SPILLWAY OUTLET STRUCTURE
6" PERFORATED CMP UNDERDRAIN
STONE WALL
LOGJAM
ERODED BANK
WET AREA
6" PERFORATED CMP UNDERDRAIN
DRAINAGE DITCHES
EMERGENCY SPILLWAY DISCHARGE CONVEYANCE CHANNEL
PRINCIPAL SPILLWAY DISCHARGE CONVEYANCE CHANNEL
KINGSLEY BROOK
LEGEND
Number refers to caption. Arrow indicates direction of photograph.
PHOTO LOCATION MAP
KINGSLEY BROOK RESERVOIR DAM
INVENTORY No. NY 353
MADISON COUNTY
LEBANON, NEW YORK

PHOTO #2: Overview of impoundment

PHOTO #3: Crest of dam looking toward left abutment

PHOTO #4: Overview of upstream face of dam

PHOTO #5: Overview of downstream face of dam

PHOTO #6: Upstream face of dam

PHOTO #7: Downstream face of dam

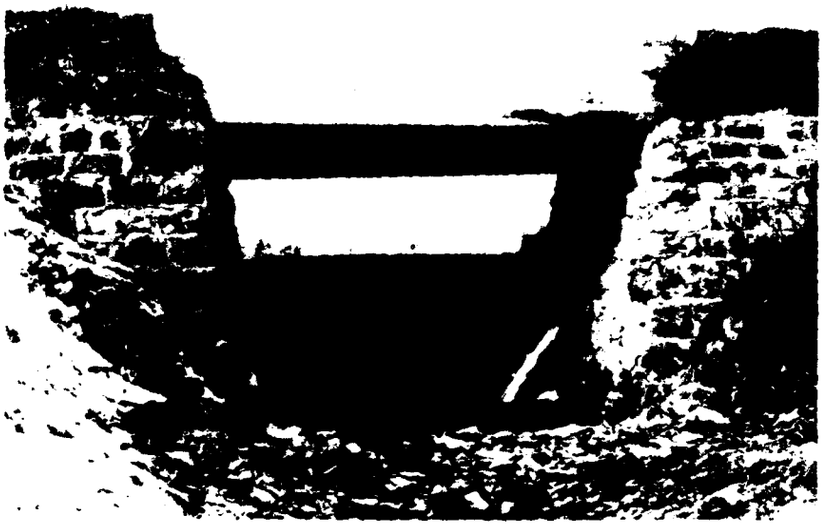


PHOTO #8: Emergency spillway looking toward impoundment

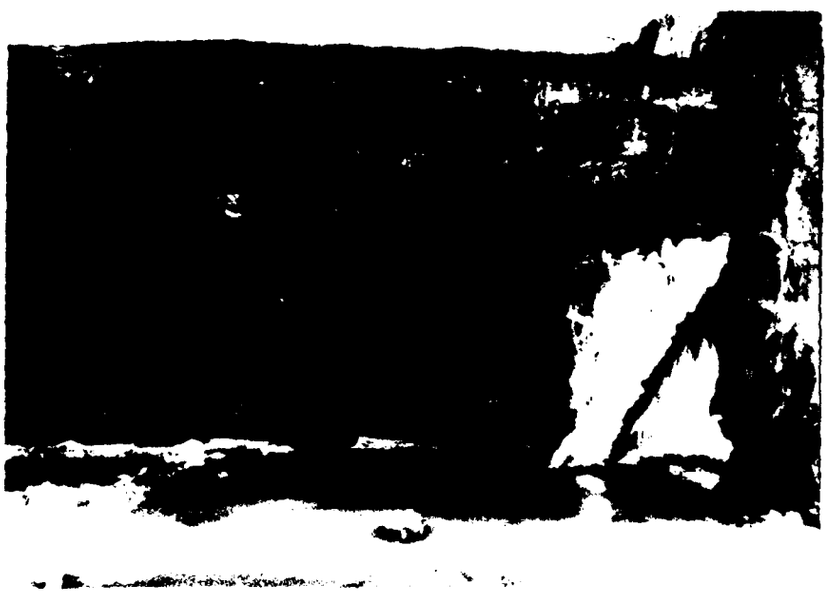


PHOTO: #9: Seepage through the stone masonry walls of the emergency spillway

PHOTO #10: Close-up of seepage through the stone masonry walls

PHOTO #11: Emergency spillway discharge conveyance channel

PHOTO #12: Logjam in the emergency spillway discharge conveyance channel

PHOTO #13: Erosion of the left bank in the emergency spillway discharge conveyance channel

PHOTO #14: Principal spillway outlet structure

PHOTO #15: Principal spillway discharge conveyance channel (left) and emergency spillway discharge conveyance channel outlet (right)

PHOTO #16: Seepage area at the right downstream toe of slope

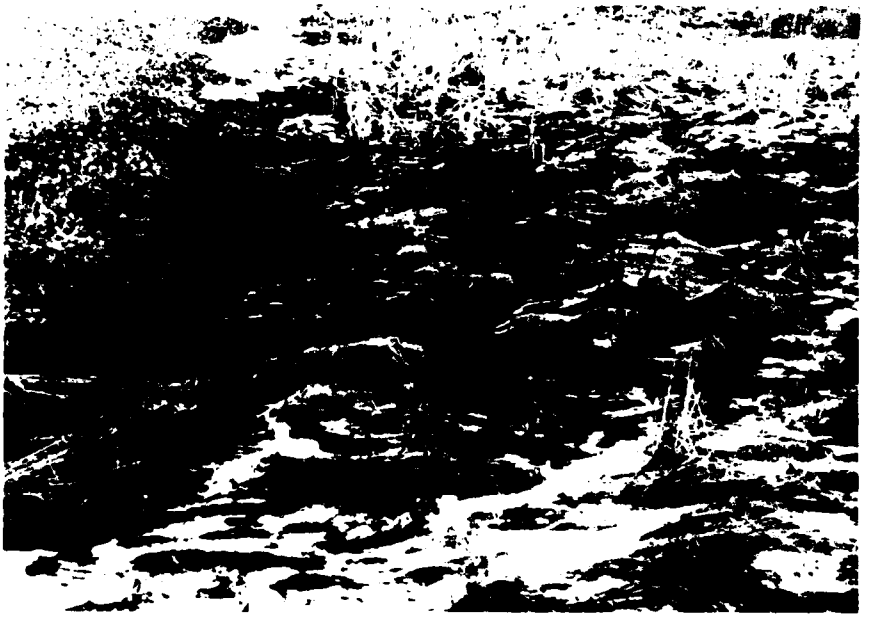


PHOTO #17: Close-up of seepage area

PHOTO #18: Minor silt boils and seepage channels in wet area of Photos No. 16 and 17

PHOTO #19: Seepage collection ditch for right downstream slope

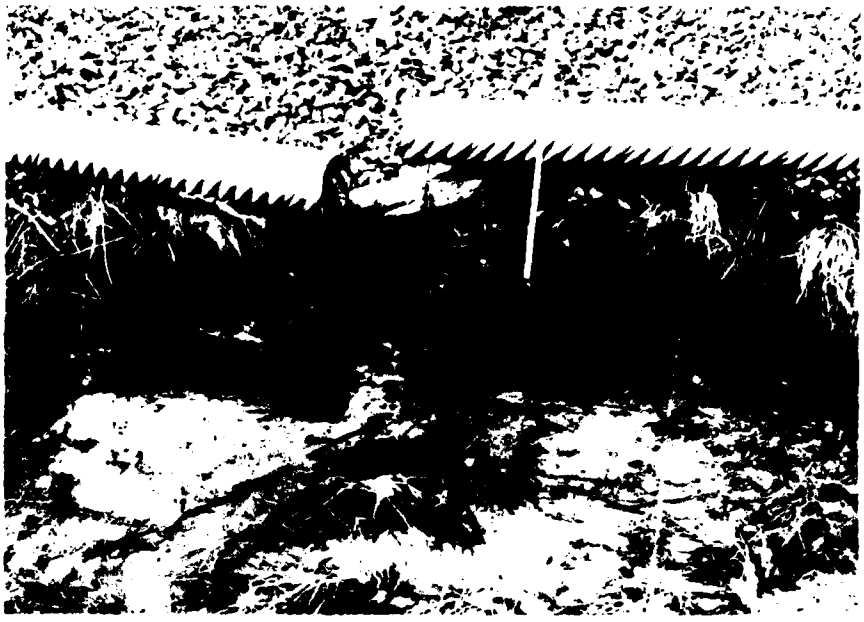


PHOTO #20: Toe drain discharge for left downstream slope

PHOTO #21: Filter fabric near the toe drain discharge

PHOTO #22: Seepage channels beneath grass in area downstream of Photo No. 20

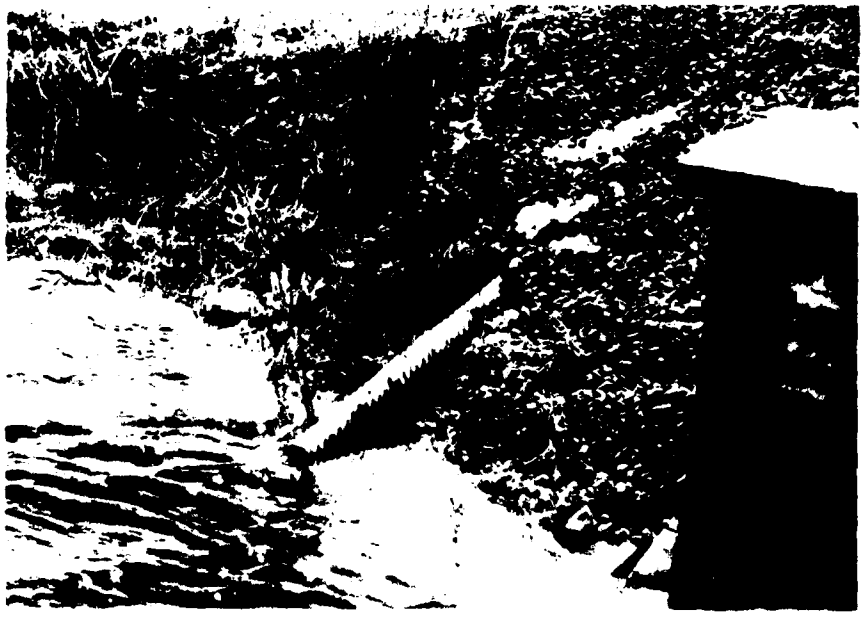


PHOTO #23: Toe drain discharge for right downstream slope

APPENDIX B

VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST

1) Basic Data

a. General

Name of Dam Kingsley Brook Reservoir Dam

Fed. I.D. # NY 353 **DEC Dam No.** 104D-698

River Basin Susquehanna

Location: Town Lebanon **County** Madison

Stream Name Kingsley Brook

Tributary of Chenango River

Latitude (N) 42° - 48.1' **Longitude (W)** 75° - 36.1'

Type of Dam Earthen embankment

Hazard Category High

Date(s) of Inspection March 11 and 13, 1981

Weather Conditions Overcast, 35° ±F.

Reservoir Level at Time of Inspection Elevation 1310 ± (NGVD)

b. Inspection Personnel R.C. Smith, T.L. Ward & R.A. Criscuolo of Flaherty Giavara Associates, P.C.; P.L. LeCount & J.J. Rixner of Haley & Aldrich, Inc.; E. Thomas of Salmon Associates.

c. Persons Contacted (Including Address & Phone No.) Mr. Frank W. Jennings, Regional Waterways Maintenance Engineer
State of New York
Department of Transportation
Region 2 Office
Utica Office Building
207 Genesec Street
Utica, New York 13501
(315) 797-6120 Ext. 2443

d. History:

Date Constructed 1835 **Date(s) Reconstructed** 1867

Designer Unknown

Constructed By Unknown

Owner State of New York - Department of Transportation, Waterways Maintenance Division

2) Embankment

a. Characteristics

(1) Embankment Material Unknown

(2) Cutoff Type Unknown

(3) Impervious Core Unknown

(4) Internal Drainage System Two perforated 6 inch diameter corrugated metal pipe (CMP) toe drains on either side of the principal spillway outlet

(5) Miscellaneous No comments

b. Crest

(1) Vertical Alignment Good; however, the center appears to be slightly lower than the ends.

(2) Horizontal Alignment Good; substantially straight

(3) Surface Cracks None observed

(4) Miscellaneous Paved town highway with gravel shoulders and metal beam guard rail

c. Upstream Slope

(1) Slope (Estimate - V:H) 1:1.5

(2) Undesirable Growth or Debris, Animal Burrows Random 6 to 8 inch diameter tree stumps cut off 1 to 2 feet above slope; scattered brush.

(3) Sloughing, Subsidence or Depressions Very steep near top of slope (above reservoir level); occasional sloughs noted.

(4) **Slope Protection** Flat platy rock riprap

(5) **Surface Cracks or Movement at Toe** None evident

d. **Downstream Slope**

(1) **Slope (Estimate - V:H)** Varies from 1:3 to 1:4

(2) **Undesirable Growth or Debris, Animal Burrows** Few small burrows noted on the left side slope of emergency spillway discharge channel; some 6 to 8 inch diameter tree stumps cut off 1 to 2 feet above slope face were observed on the upper portions.

(3) **Sloughing, Subsidence or Depressions** Surface sloughs were noted on the very steep upper slope

(4) **Surface Cracks or Movement at Toe** None observed

(5) **Seepage** Seepage was emanating from beneath the crushed stone filter blanket in the wet areas along the toe of slope; boils noted in the low, swampy area to the right of the principal spillway outlet

(6) **External Drainage System (Ditches, Trenches, Blanket)** Filter fabric covered with a 2 foot blanket of crushed stone and drainage ditches were constructed as part of corrective work in 1978

(7) **Condition Around Outlet Structure** Cut stone masonry outlet structure in good condition

(8) **Seepage Beyond Toe** Wet, swampy area observed at and beyond the toe slope to the right of the principal spillway outlet

e. **Abutments - Embankment Contact**

Right: good condition

Left: good condition; some minor sloughs

(1) **Erosion at Contact** None apparent

(2) **Seepage Along Contact** None observed

3) **Drainage System**

a. **Description of System** Submerged intake structure controlled by four 8 inch diameter gated inlet pipes discharging into an elliptical 7 foot high by 4 foot wide cut stone masonry tunnel and excavated discharge conveyance channel

b. **Condition of System** Good; gate valves are kept operable by the Waterways Maintenance Division of the New York State Department of Transportation.

c. **Discharge from Drainage System** Cut stone masonry outlet structure in good condition

4) **Instrumentation** (Monumentation/Surveys, Observation Wells, Weirs, Peizometers, Etc.)

None observed

5) **Reservoir**

a. **Slopes** Moderately sloping woodlands and open fields

b. **Sedimentation** No apparent problems

c. **Unusual Conditions Which Affect Dam** None apparent

6) **Area Downstream of Dam**

a. **Downstream Hazard (No. of Homes, Highways, etc.)** Approximately 1 dwelling, two roads and high voltage transmission lines are within the dam failure flood hazard area

b. **Seepage, Unusual Growth** None observed

c. **Evidence of Movement Beyond Toe of Dam** None evident

d. **Condition of Downstream Channel** Good; presently stable, no aggradation or degradation

7) **Spillway(s) (Including Discharge Conveyance Channel)**

Principal spillway, emergency spillway and discharge conveyance channels

a. **General** Principal spillway and discharge conveyance channel handle normal flows while the emergency spillway and discharge conveyance channel convey flow during overflow conditions

b. **Condition of Principal Spillway** Visable components were in good condition

c. **Condition of Emergency Spillway** Some seepage through the masonry joints

d. **Condition of Discharge Conveyance Channel** Principal spillway: good condition presently stable; emergency spillway: fair condition, a logjam has formed and the left side slope downstream of the logjam is severely eroded.

8) **Reservoir Drain/Outlet**

Type: **Pipe** Four **Conduit** _____ **Other** Elliptical tunnel

Material: **Concrete** _____ **Metal** cast iron **Other** Cut stone masonry

Size: 8 inch/7 feet high by 4 feet wide **Length** unknown/ 320 feet

Invert Elevations: **Entrance** 1262.8 (NGVD) **Exit** 1255.0 (NGVD)

Physical Condition (Describe): **Unobservable** _____

Material: Unknown/good

Joints: Unknown/good **Alignment** Unknown/straight

Structural Integrity: Unknown/good

Hydraulic Capability: Good; the gate valves are used to regulate the reservoir water level.

Means of Control: **Gate** _____ **Valve** Four **Uncontrolled** _____

Operation: **Operable** X **Inoperable** _____ **Uncontrolled** _____

Present Condition (Describe): Good; the valves were not operated during the inspection; however, they are maintained regularly according to the Waterways Maintenance Division of DOT

9) **Structural**

a. **Concrete Surfaces** Some minor concrete spalling of the upstream fascia and of the concrete encasement at soffit of stringers of the bridge over the emergency spillway (See the sketch on page B-10).

b. **Structural Cracking** No evidence of any major structural cracks

c. **Movement - Horizontal & Vertical Alignment (Settlement)** None observed

d. **Junctions with Abutments or Embankments** Seepage was observed through the masonry joints of the spillway and abutment walls (See sketch on page B-10)

e. **Drains - Foundation, Joint, Face** None evident

f. **Water Passages, Conduits, Sluices** None observed

g. **Seepage or Leakage** Seepage was noted through the cut stone masonry of the spillway and abutment walls (See sketch on page B-10).

h. **Joints - Construction, etc.** Some open joints in stone masonry of the emergency spillway

i. **Foundation** Inaccessible

j. **Abutments** Minor openings in masonry joints as noted in 9h. above

k. **Control Gates** Gate valves control the flow of water through the principal spillway tunnel.

l. **Approach & Outlet Channels** Not applicable

m. **Energy Dissipators (Plunge Pool, etc.)** None observed

n. **Intake Structures** Inaccessible

o. **Stability** Appears to be stable

p. **Miscellaneous** No comments

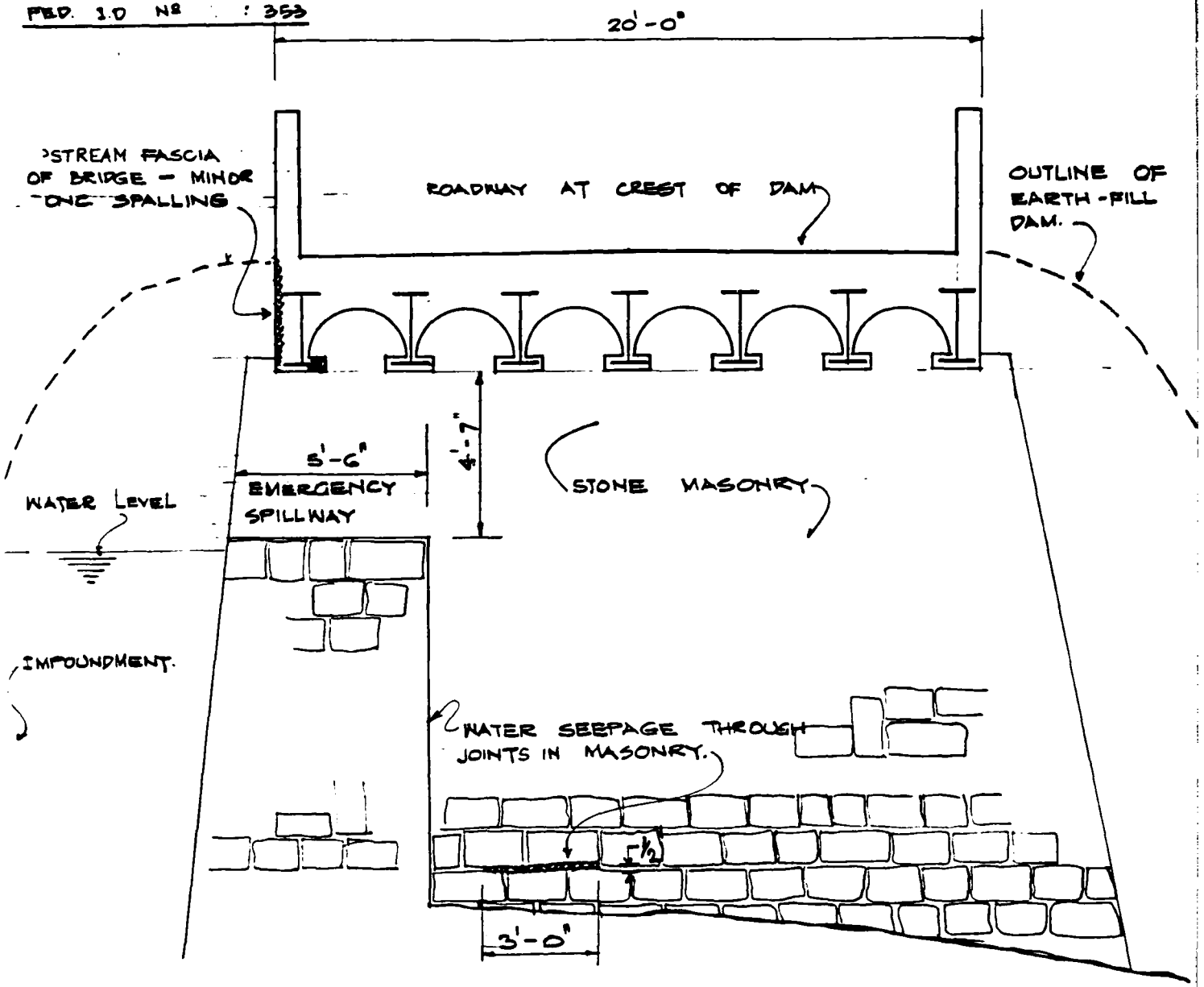
10) Appurtenant Structures (Power House, Lock, Gatehouse, Other)

a. Description and Condition

1. Intake structure: It was submerged and therefore inaccessible

2. Bridge over emergency spillway weir: Good condition.

FED. I.D Nº : 353



·SECTION THRU DAM - AT BRIDGE.·

APPENDIX C

HYDROLOGIC/HYDRAULIC ENGINEERING DATA AND COMPUTATIONS

CHECK LIST FOR DAMS
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

AREA-CAPACITY DATA:

	Elevation (ft.)	Surface Area (acres)	Storage Capacity (acre-ft.)
1) Top of Dam	1317.0	113	2260
2) Design High Water (Max. Design Pool)	--	--	--
3) Emergency Spillway Crest	1311.0	95	1640
4) Pool Level with Flashboards	--	--	--
5) Principal Spillway Crest	1262.8	0	0

DISCHARGES:

	Volume (cfs)
1) Average Daily	Unknown
2) Emergency Spillway @ Maximum High Water (Top of Dam)	671
3) Principal Spillway @ Maximum High Water (Top of Dam)	50
4) Principal Spillway @ Emergency Spillway Crest	47
5) Low Level Outlet @ Principal Spillway Crest	0
6) Total (of all facilities) @ Maximum High Water	718
7) Maximum Known Flood	Unknown
8) At Time of Inspection	Unknown

CREST: **ELEVATION:** 1317.0 to 1318.4

Type Earthen embankment with a two lane paved town highway, gravel shoulders and metal beam guard rail over its length

Width 20 feet **Length** 900 feet

Spillover Cut stone masonry spillway

Location Right Abutment

SPILLWAY:

PRINCIPAL		EMERGENCY
1262.8 (NGVD)	**Elevation**	1311.0 (NGVD)
Four 8 inch CIP	**Type**	Broad-crested weir
--	**Width**	5.5 feet
	Type of Control	
--	**Uncontrolled**	Weir
Orifice	**Controlled**	--
Gate Valves	**Type: (Flashboards; Gate)**	None
Four	**Number**	One
8 inch valves/not applicable	**Size/Length**	16 foot long weir
Cast iron and stone masonry	**Invert Material**	Stone masonry
Continuously	**Anticipated Length of Operating Service**	Unknown
Not applicable	**Chute Length**	85 feet
Unknown	**Height Between Spillway Crest & Approach Channel Invert (Weir Flow)**	2 ± feet

Type:

Location:

Records:

Date Unknown

Max. Reading Unknown

FLOOD WATER CONTROL SYSTEM:

Warning System None in effect

Method of Controlled Releases (mechanisms) Gate valves used to control flow to the principal spillway tunnel

DRAINAGE AREA: 3332 acres = 5.21 square miles

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type Rural, agriculture

Terrain - Relief Rolling

Surface - Soil Glacial till

Runoff Potential (existing or planned extensive alterations to existing surface or subsurface conditions)

Primarily open fields with scattered woodlands; glacial till soils; average watershed slope is 10 ± percent; some residential homes and roadways.

Potential Sedimentation problem areas (natural or man-made; present or future)

Possible surface erosion from agricultural fields during fallow periods

Potential Backwater problem areas for levels at maximum storage capacity including surcharge storage:

None

Dikes - Floodwalls (overflow & non-overflow) - Low reaches along the reservoir perimeter:

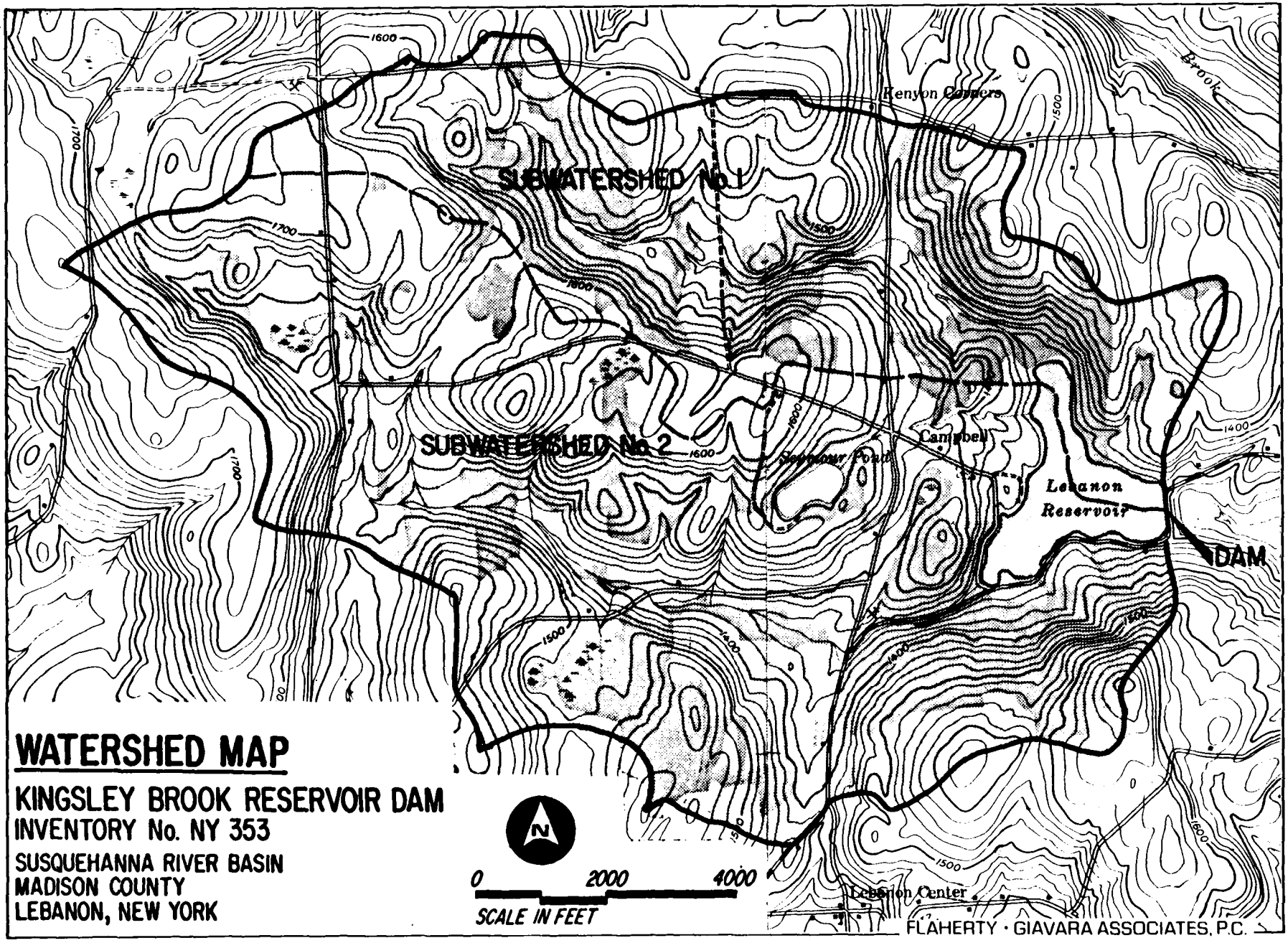
Location: None

Elevation:

Reservoir:

Length @ Maximum Pool 3200 ± feet = 0.6 miles **(Miles)**

Length of Shoreline (@ Spillway Crest) 11400 ± feet = 2.2 miles **(Miles)**



WATERSHED MAP

KINGSLEY BROOK RESERVOIR DAM
INVENTORY No. NY 353

SUSQUEHANNA RIVER BASIN
MADISON COUNTY
LEBANON, NEW YORK

FLAHERTY · GIAVARA ASSOCIATES, P.C.

CALCULATIONS

PROJECT Corps Dams NY 353

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN 06510/203/789-1260

SHEET NO. 1 OF 6
BY RAC DATE 6-2-81
CHK'D. BY TLW DATE 6-3-81

WATERSHED DATA FOR HEC-1 SNYDER HYDROGRAPH

1) TIME TO PEAK (T_P) - SUB-WATERSHED #1

$L = 15{,}500$ ft $= 2.93$ miles
$L_C = 6{,}500$ ft $= 1.23$ miles
$C_T = 2.0$ for average slopes

$$T_p = C_T (L \times L_C)^{0.3}$$
$$= 2.0 (2.93 \times 1.23)^{0.3} = 2.94 \text{ HOURS}$$

$$t_T = \frac{t_p}{5.5} = \frac{2.94}{5.5} = 0.53 \qquad \text{USE } t_R = 0.5$$

$$t_{PR} = t_p + 0.25 (t_R - t_T)$$
$$= 2.94 + 0.25(0.5 - 0.53)$$
$$= 2.93 \text{ HOURS}$$

2) $C_p = 0.63$ FOR HIGHLAND AREA

3) % IMPERVIOUS

ROADS - 8000 LF x 25' = 200,000 ft²
HOUSES - 1 @ 1000 ft² = 1000 ft²
201,000 ft²

$201{,}000 \text{ ft}^2 = 4.6$ acres

$\frac{4.6 \text{ ACRES}}{1207.6 \text{ ACRES}} = 0.4\ \%$

4) WATERSHED AREA

1207.6 ACRES / 640 = 1.89 Square Miles

BASED ON 1" = 2000' USGS MAP

SUB-WATERSHED #2

$L = 18{,}000\ ft = 3.41$ miles
$L_c = 7{,}000\ ft = 1.33$ miles
$C_T = 2.0$ for average slopes

1) T_P

$$T_P = 2.0(3.41 \times 1.33)^{0.3} = 3.15 \text{ HOURS}$$

$$t_r = \frac{t_p}{5.5} = \frac{3.15}{5.5} = 0.57 \qquad \text{USE } t_R = 0.5$$

$$t_{PR} = t_p + 0.25(t_R - t_r)$$

$$= 3.15 + 0.25(0.5 - 0.57)$$

$$= 3.13 \text{ HOURS}$$

2) $C_p = 0.63$ for HIGHLAND AREA

3) % IMPERVIOUS

ROADS	37,000 LF x 25′ =	925,000 ft²
HOUSES	± 15 @ 1000 =	15,000 ft²
		940,000 ft²

$940{,}000\ ft^2 = 21.6$ ACRES

$$\frac{21.6 \text{ ACRES}}{2122.1 \text{ ACRES}} = 1.0\ \%$$

4) WATERSHED AREA

2122.1 ACRES / 640 = 3.32 square miles

BASED ON 1" = 2000′ USGS MAP

5) RAINFALL DATA - (FROM HYDROMETEOROLOGICAL REPORT NO. 33)

24 Hr PMP = 20.0 inches For 200 Square Miles

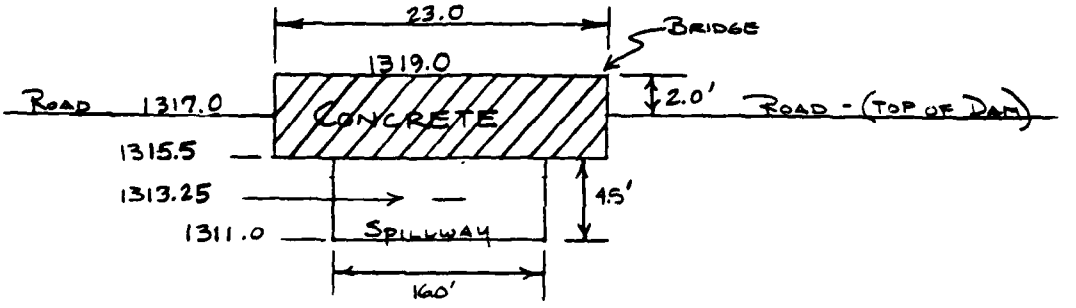
Duration (HRS)	Adj Factor (%)
6	111
12	122
24	133
48	143

PROJECT Corps Dams
NY 353

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN 06510/203/789-1260

SHEET NO. 4 OF 6
BY RAC DATE 4-6-81
CHK'D. BY TLW DATE 5-19-81

* Stage Discharge Data



Stage	$Q=2.5LH^{1.5}$	$Q=3.0LH^{1.5}$	$Q=CA\sqrt{2GH}$	Discharge
1311.0	–	–	–	0
1312.0	–	$(3)(16)(1)$	–	48.0
1313.0	–	$(3)(16)(2)^{1.5}$	–	135.8
1314.0	–	$(3)(16)(3)^{1.5}$	–	249.4
1315.0	–	$(3)(16)(4)^{1.5}$	–	384.0
1315.5	–	$(3)(16)(4.5)^{1.5}$	–	458.2
1316.0	–	–	$(.6)(16\times4.5)\sqrt{64.4\times2.75}$	574.2
1317.0	–	–	$43.2\sqrt{64.4\times3.75}$	671.3
1318.0	$(2.5)(877)(1.0)^{1.5}$	–	$43.2\sqrt{64.4\times4.75}$	2948.1
1319.0	$(2.5)(877)(2.0)^{1.5}$	0	$43.2\sqrt{64.4\times5.75}$	7032.6
1320.0	$(2.5)(877)(3.0)^{1.5}$	$(2.5)(23)(1.0)^{1.5}$	$43.2\sqrt{64.4\times6.75}$	12350.8
1321.0	$(2.5)(877)(4.0)^{1.5}$	$(2.5)(23)(2.0)^{1.5}$	$43.2\sqrt{64.4\times7.75}$	18667.7
1322.0	$(2.5)(877)(5.0)^{1.5}$	$(2.5)(23)(3.0)^{1.5}$	$43.2\sqrt{64.4\times8.75}$	25837.2

* Stage discharge is for the spillway section and dam overtopping only. It was assumed the reservoir drain was not open; however, it was operating at the time of the inspection.

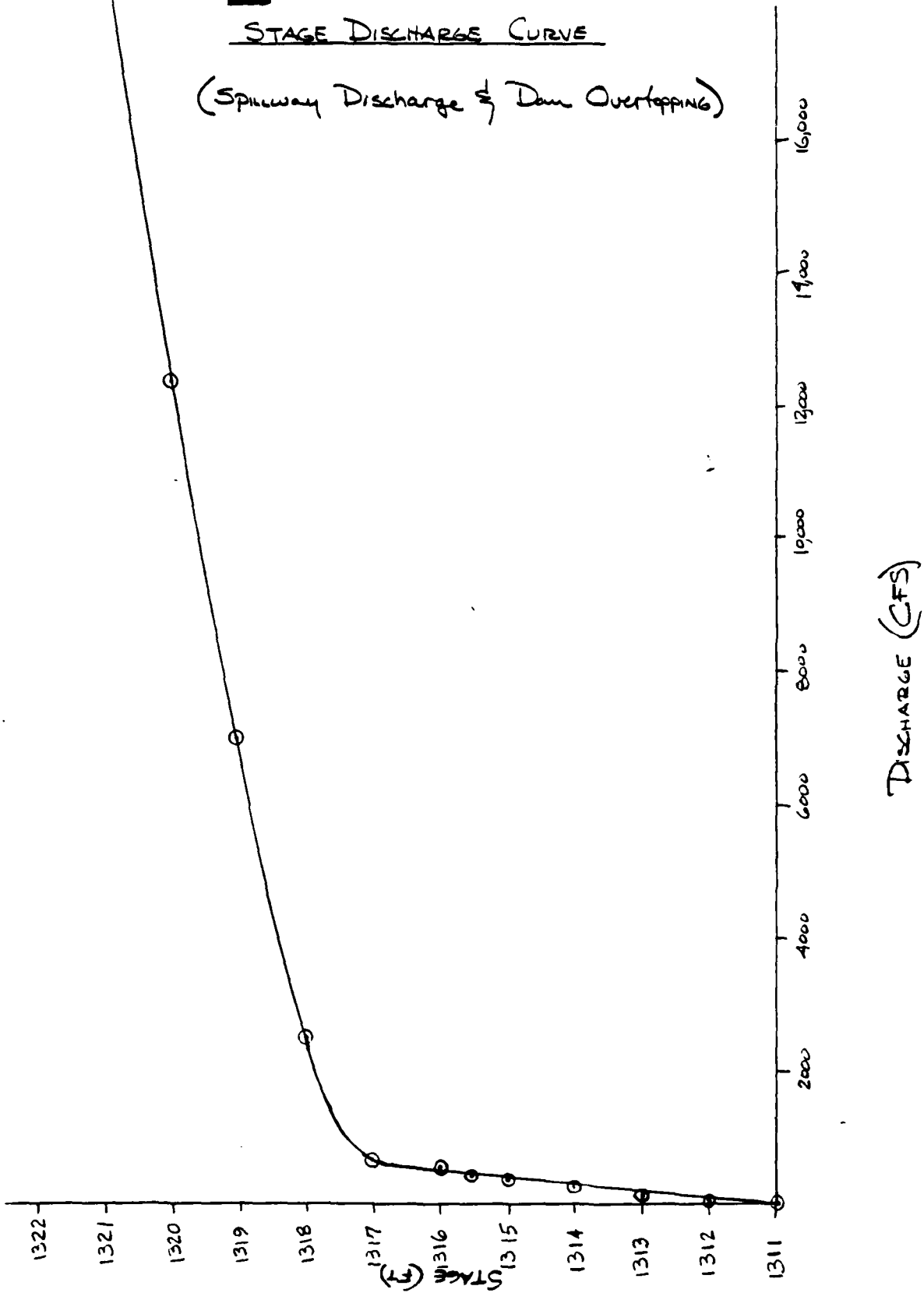
PROJECT Corps Dams
NY 353

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN 06510/203/789-1260

SHEET NO. 5 OF 6
BY RAG DATE 4-6-81
CHK'D. BY TLW DATE 5-19-81

STAGE DISCHARGE CURVE

(Spillway Discharge & Dam Overtopping)



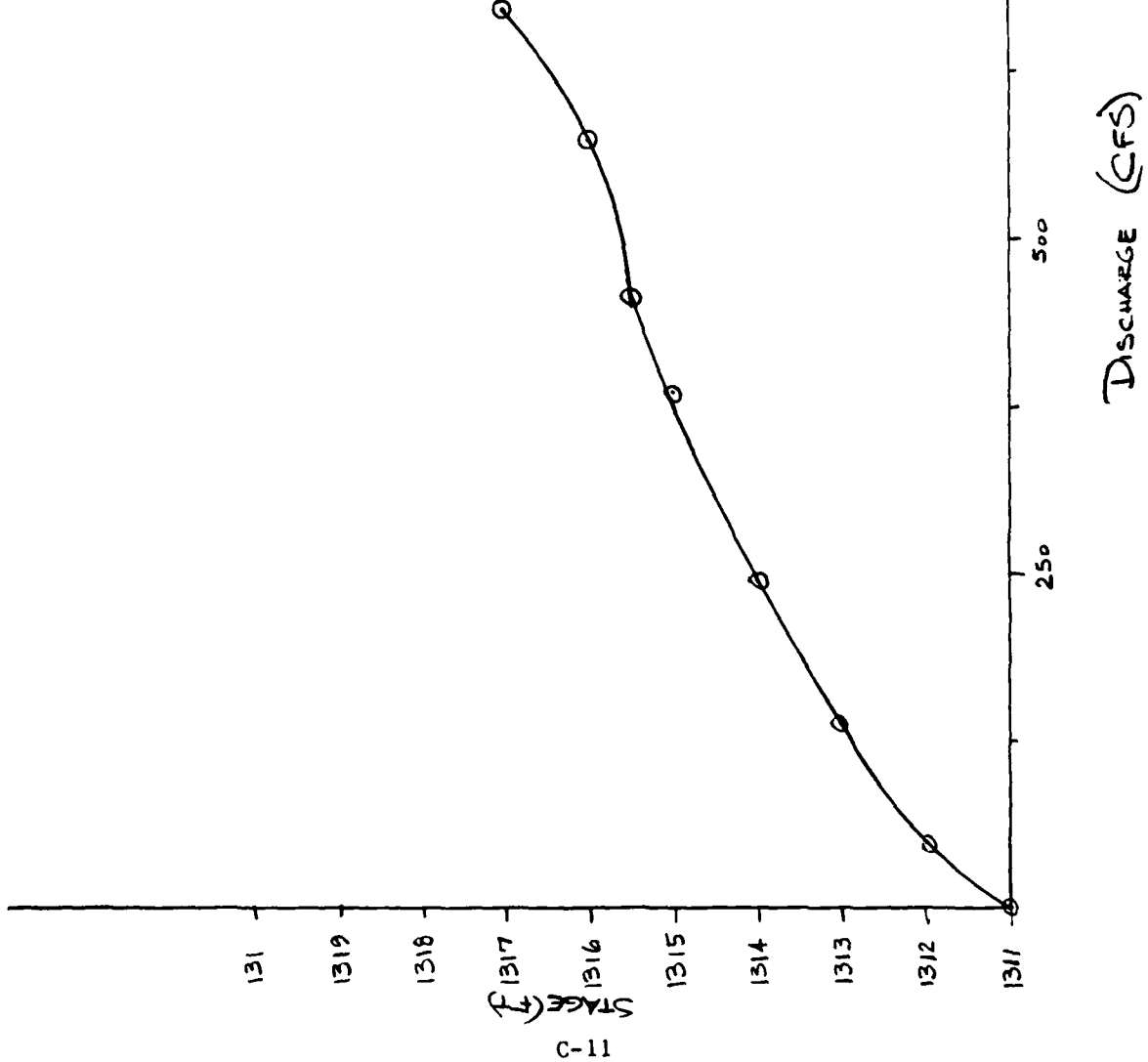
PROJECT CORPS DAMS
NY 353

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN 06510/203/789-1260

SHEET NO. 6 OF 6
BY RAC DATE 4-6-81
CHK'D. BY TLW DATE 5-19-81

STAGE DISCHARGE CURVE

SPILLWAY DISCHARGE



HEC-1 FLOOD HYDROGRAPH COMPUTATIONS

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FLAHERTY GIAVARA ASSOCIATES, P.C.
**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********************************
     1                A1  NATIONAL DAM INSPECTION PROGRAM, PHASE I REPORT, CORPS OF ENGINEERS - NEW YORK DISTRICT
     2                A2  DAM INVENTORY NO. NY 393, KINGSLEY BROOK RESERVOIR DAM, MADISON COUNTY, NEW YORK, APRIL 3, 1981
     3                A3  PREPARED BY FLAHERTY GIAVARA ASSOCIATES, P.C., ONE COLUMBUS PLAZA, NEW HAVEN, CONNECTICUT
     4                B    120          0         30          0          0          0          0          2          0          0
     5                B1     5
     6                J      1          9          1
     7                J1  0.10       0.18       0.19       0.20       0.21       0.22       0.23       0.50       1.00
     8                K      0          1                     0          0          1          0
     9                K1  INFLOW HYDROGRAPH, SUBWATERSHED NO. 1 - SNYDER METHOD
    10                M      1          1       1.89                  5.21          0                                1
    11                P      0       20.0        111        122        133        143
    12                T                                                                    1        0.1                  0.004
    13                W   2.93       0.63
    14                X   -2.0      -0.10        1.5
    15                K      0          1                     0          0          1          0
    16                K1  INFLOW HYDROGRAPH, SUBWATERSHED NO. 2 - SNYDER METHOD
    17                M      1          1       3.32                  5.21          0                                1
    18                P      0       20.0        111        122        133        143
    19                T                                                                    1                          0.01
    20                W   3.13       0.63
    21                X   -2.0      -0.10        1.5
    22                K      2          1                     0          0          1          0
    23                K1  INFLOW HYDROGRAPHS - SUBWATERSHEDS NO. 1 & NO. 2 COMBINED
    24                K      1          1                     0          0          1          0
    25                K1  RESERVOIR ROUTING - MODIFIED PULS METHOD
    26                Y                                    1          1
    27                Y1     1                                                    0          1
    28                Y41311.0  1312.0  1313.0  1314.0  1315.0  1315.5  1316.0  1317.0  1318.0  1319.0
    29                Y41320.0
    30                Y3     0    48.0   135.8   249.4   384.0   458.2   574.9   671.3  2948.1  7032.6
    31                Y912390.
    32                $A 119.4   137.7   192.8
    33                $E1311.0  1320.0  1340.0
    34                $$1311.0
    35                $D1317.0     2.9     1.9   877.9
    36                K     99

                                PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS
                                      RUNOFF HYDROGRAPH AT          1
                                      RUNOFF HYDROGRAPH AT          1
                                      COMBINE  2 HYDROGRAPHS AT     1
                                      ROUTE HYDROGRAPH TO           1
                                      END OF NETWORK

**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********************************

RUN  DATE: 8/21/
     TIME: 9:56 AM
```

NATIONAL DAM INSPECTION PROGRAM, PHASE I REPORT, CORPS OF ENGINEERS - NEW YORK DISTRICT
DAM INVENTORY NO. NY 393, KINGSLEY BROOK RESERVOIR DAM, MADISON COUNTY, NEW YORK, APRIL 3, 1981
PREPARED BY FLAHERTY GIAVARA ASSOCIATES, P.C., ONE COLUMBUS PLAZA, NEW HAVEN, CONNECTICUT

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
120	0	30	0	0	0	0	2	0	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 9 LRTIO= 1

RTIOS= 0.10 0.18 0.19 0.20 0.21 0.22 0.23 0.50 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH, SUBWATERSHED NO. 1 - SNYDER METHOD

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	0	0	0

HYDROGRAPH DATA

IHYDQ	IUHQ	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	1.89	0.00	3.21	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	20.00	111.00	122.00	133.00	143.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.10	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 2.93 CP=0.63 NTA= 0

RECESSION DATA
STRTQ= -2.00 QRCSN= -0.10 RTIOR= 1.50

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 6.65 AND R= 9.22 INTERVALS

UNIT HYDROGRAPH 32 END-OF-PERIOD ORDINATES, LAG= 2.91 HOURS, CP= 0.64 VOL= 1.00

18.	64.	127.	192.	243.	267.	258.	222.	183.	151.						
125.	103.	85.	70.	58.	48.	39.	33.	27.	22.						
18.	15.	12.	10.	8.	7.	6.	5.	4.	3.						
3.	2.														

END-OF-PERIOD FLOW

MO. DA	HR. MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO. DA	HR. MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	0.30	1	0.00	0.00	0.00	4.	1.02	6.30	61	0.15	0.10	0.05	21.
1.01	1.00	2	0.00	0.00	0.00	3.	1.02	7.00	62	0.15	0.10	0.05	27.
1.01	1.30	3	0.00	0.00	0.00	3.	1.02	7.30	63	0.18	0.10	0.05	39.
1.01	2.00	4	0.00	0.00	0.00	3.	1.02	8.00	64	0.19	0.10	0.05	55.

1.01	2.30	5	0.00	0.00	0.00	2.	1.02	8.30	65	0.13	0.10	0.05	77.
1.01	3.00	6	0.00	0.00	0.00	3.	1.02	9.00	66	0.15	0.10	0.05	101.
1.01	3.30	7	0.00	0.00	0.00	3.	1.02	9.30	67	0.15	0.10	0.05	124.
1.01	4.00	8	0.00	0.00	0.00	3.	1.02	10.00	68	0.15	0.10	0.05	143.
1.01	4.30	9	0.00	0.00	0.00	3.	1.02	10.30	69	0.15	0.10	0.05	159.
1.01	5.00	10	0.00	0.00	0.00	2.	1.02	11.00	70	0.15	0.10	0.05	173.
1.01	5.30	11	0.00	0.00	0.00	2.	1.02	11.30	71	0.15	0.10	0.05	184.
1.01	6.00	12	0.00	0.00	0.00	2.	1.02	12.00	72	0.15	0.10	0.05	193.
1.01	6.30	13	0.01	0.00	0.01	2.	1.02	12.30	73	0.89	0.84	0.05	214.
1.01	7.00	14	0.01	0.00	0.01	2.	1.02	13.00	74	0.89	0.84	0.05	267.
1.01	7.30	15	0.01	0.00	0.01	2.	1.02	13.30	75	1.07	1.02	0.05	327.
1.01	8.00	16	0.01	0.00	0.01	2.	1.02	14.00	76	1.07	1.02	0.05	327.
1.01	8.30	17	0.01	0.00	0.01	2.	1.02	14.30	77	1.33	1.28	0.05	738.
1.01	9.00	18	0.01	0.00	0.01	2.	1.02	15.00	78	1.33	1.28	0.05	990.
1.01	9.30	19	0.01	0.00	0.01	2.	1.02	15.30	79	1.62	1.37	0.05	1265.
1.01	10.00	20	0.01	0.00	0.01	2.	1.02	16.00	80	5.13	5.08	0.05	1610.
1.01	10.30	21	0.01	0.00	0.01	2.	1.02	16.30	81	1.24	1.19	0.05	2031.
1.01	11.00	22	0.01	0.00	0.01	2.	1.02	17.00	82	1.24	1.19	0.05	2525.
1.01	11.30	23	0.01	0.00	0.01	2.	1.02	17.30	83	0.98	0.93	0.05	2967.
1.01	12.00	24	0.01	0.00	0.01	2.	1.02	18.00	84	0.98	0.93	0.05	3297.
1.01	12.30	25	0.07	0.00	0.07	1.	1.02	18.30	85	0.09	0.04	0.05	3449.
1.01	13.00	26	0.07	0.00	0.07	1.	1.02	19.00	86	0.09	0.04	0.05	3383.
1.01	13.30	27	0.08	0.00	0.08	1.	1.02	19.30	87	0.09	0.04	0.05	3128.
1.01	14.00	28	0.08	0.00	0.08	1.	1.02	20.00	88	0.09	0.04	0.05	2786.
1.01	14.30	29	0.10	0.00	0.10	1.	1.02	20.30	89	0.09	0.04	0.05	2419.
1.01	15.00	30	0.10	0.00	0.10	1.	1.02	21.00	90	0.09	0.04	0.05	2054.
1.01	15.30	31	0.12	0.00	0.12	1.	1.02	21.30	91	0.09	0.04	0.05	1720.
1.01	16.00	32	0.39	0.16	0.22	4.	1.02	22.00	92	0.09	0.04	0.05	1435.
1.01	16.30	33	0.09	0.04	0.05	13.	1.02	22.30	93	0.09	0.04	0.05	1201.
1.01	17.00	34	0.09	0.04	0.05	26.	1.02	23.00	94	0.09	0.04	0.05	1007.
1.01	17.30	35	0.07	0.02	0.05	42.	1.02	23.30	95	0.09	0.04	0.05	847.
1.01	18.00	36	0.07	0.02	0.05	57.	1.03	0.00	96	0.09	0.04	0.05	715.
1.01	18.30	37	0.01	0.00	0.01	68.	1.03	0.30	97	0.00	0.00	0.00	606.
1.01	19.00	38	0.01	0.00	0.01	73.	1.03	1.00	98	0.00	0.00	0.00	514.
1.01	19.30	39	0.01	0.00	0.01	71.	1.03	1.30	99	0.00	0.00	0.00	435.
1.01	20.00	40	0.01	0.00	0.01	64.	1.03	2.00	100	0.00	0.00	0.00	366.
1.01	20.30	41	0.01	0.00	0.01	56.	1.03	2.30	101	0.00	0.00	0.00	336.
1.01	21.00	42	0.01	0.00	0.01	47.	1.03	3.00	102	0.00	0.00	0.00	323.
1.01	21.30	43	0.01	0.00	0.01	39.	1.03	3.30	103	0.00	0.00	0.00	310.
1.01	22.00	44	0.01	0.00	0.01	33.	1.03	4.00	104	0.00	0.00	0.00	298.
1.01	22.30	45	0.01	0.00	0.01	27.	1.03	4.30	105	0.00	0.00	0.00	286.
1.01	23.00	46	0.01	0.00	0.01	22.	1.03	5.00	106	0.00	0.00	0.00	274.
1.01	23.30	47	0.01	0.00	0.01	19.	1.03	5.30	107	0.00	0.00	0.00	264.
1.02	0.00	48	0.01	0.00	0.01	15.	1.03	6.00	108	0.00	0.00	0.00	253.
1.02	0.30	49	0.06	0.01	0.05	13.	1.03	6.30	109	0.00	0.00	0.00	243.
1.02	1.00	50	0.06	0.01	0.05	11.	1.03	7.00	110	0.00	0.00	0.00	233.
1.02	1.30	51	0.06	0.01	0.05	11.	1.03	7.30	111	0.00	0.00	0.00	224.
1.02	2.00	52	0.06	0.01	0.05	11.	1.03	8.00	112	0.00	0.00	0.00	215.
1.02	2.30	53	0.06	0.01	0.05	12.	1.03	8.30	113	0.00	0.00	0.00	207.
1.02	3.00	54	0.06	0.01	0.05	13.	1.03	9.00	114	0.00	0.00	0.00	198.
1.02	3.30	55	0.06	0.01	0.05	15.	1.03	9.30	115	0.00	0.00	0.00	191.
1.02	4.00	56	0.06	0.01	0.05	16.	1.03	10.00	116	0.00	0.00	0.00	183.
1.02	4.30	57	0.06	0.01	0.05	17.	1.03	10.30	117	0.00	0.00	0.00	176.
1.02	5.00	58	0.06	0.01	0.05	18.	1.03	11.00	118	0.00	0.00	0.00	169.
1.02	5.30	59	0.06	0.01	0.05	19.	1.03	11.30	119	0.00	0.00	0.00	162.
1.02	6.00	60	0.06	0.01	0.05	19.	1.03	12.00	120	0.00	0.00	0.00	156.
									SUM	22.88	19.19	3.69	49799.

(981.)(487.)(74.)(1610.15)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3449.	2608.	993.	414.	49720.
CMS	98.	74.	28.	12.	1408.
INCHES		12.84	19.54	20.39	20.39
MM		326.10	496.39	517.98	517.98
AC-FT		1293.	1969.	2055.	2055.
THOUS CU M		1595.	2429.	2534.	2534.

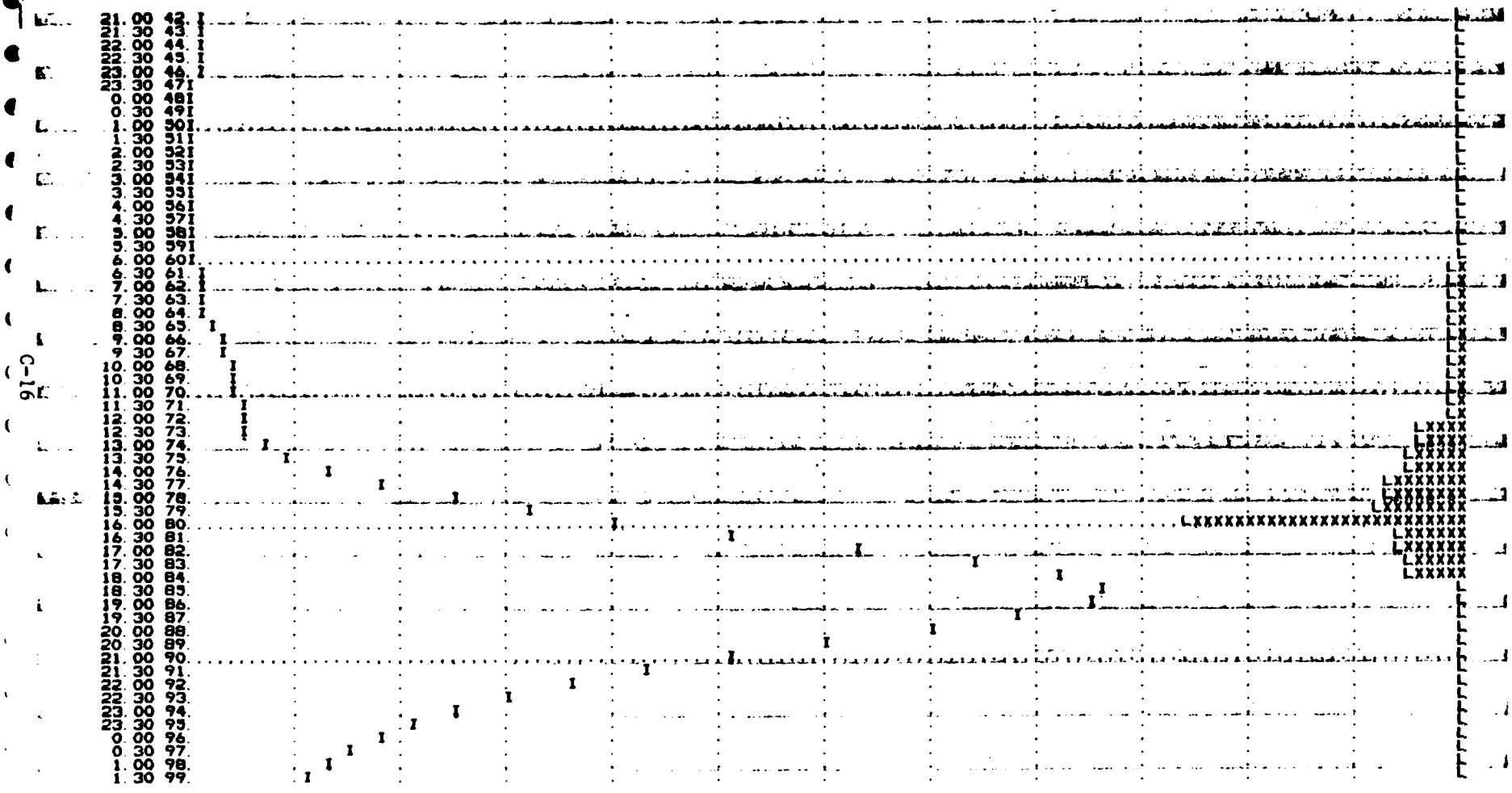
DVF

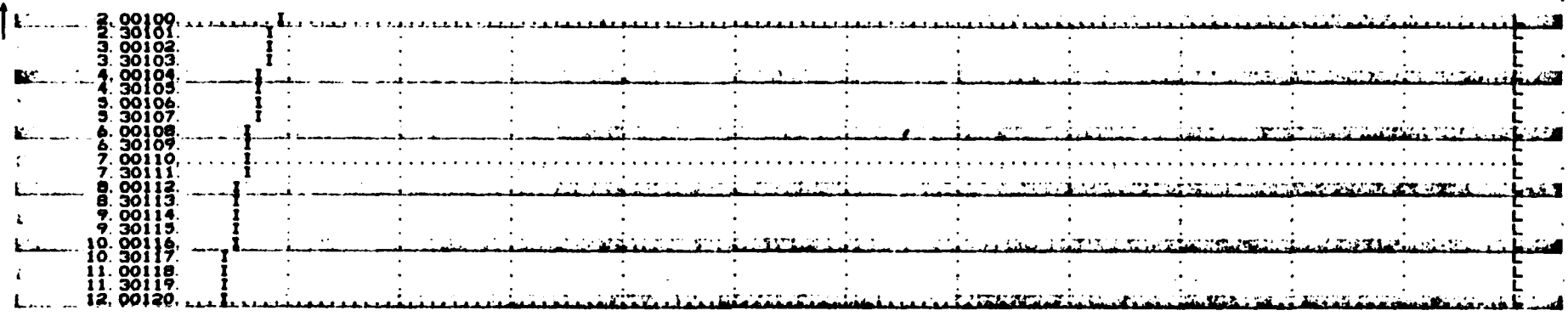
STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

PRECIP(L) AND EXCESS(X)

	0.	400.	800.	1200.	1600.	2000.	2400.	2800.	3200.	3600.	0.	0.	0.
	0.	Q	Q	Q	Q	Q	Q	Q	Q	Q	L	E	Q
0. 30	11												
1. 00	21												
1. 30	31												
2. 00	41												
2. 30	51												
3. 00	61												
3. 30	71												
4. 00	81												
4. 30	91												
5. 00	101												
5. 30	111												
6. 00	121												
6. 30	131												
7. 00	141												
7. 30	151												
8. 00	161												
8. 30	171												
9. 00	181												
9. 30	191												
10. 00	201												
10. 30	211												
11. 00	221												
11. 30	231												
12. 00	241												
12. 30	251												
13. 00	261												
13. 30	271												
14. 00	281												
14. 30	291												
15. 00	301												
15. 30	311												
16. 00	321												
16. 30	331												
17. 00	34. I												
17. 30	35. I												
18. 00	36. I												
18. 30	37. I												
19. 00	38. I												
19. 30	39. I												
20. 00	40. I												
20. 30	41. I												


21.00 42.
21.30 43.
22.00 44.
22.30 45.
23.00 46.
23.30 47.
0.00 48.
0.30 49.
1.00 50.
1.30 51.
2.00 52.
2.30 53.
3.00 54.
3.30 55.
4.00 56.
4.30 57.
5.00 58.
5.30 59.
6.00 60.
6.30 61.
7.00 62.
7.30 63.
8.00 64.
8.30 65.
9.00 66.
9.30 67.
10.00 68.
10.30 69.
11.00 70.
11.30 71.
12.00 72.
12.30 73.
13.00 74.
13.30 75.
14.00 76.
14.30 77.
15.00 78.
15.30 79.
16.00 80.
16.30 81.
17.00 82.
17.30 83.
18.00 84.
18.30 85.
19.00 86.
19.30 87.
20.00 88.
20.30 89.
21.00 90.
21.30 91.
22.00 92.
22.30 93.
23.00 94.
23.30 95.
0.00 96.
0.30 97.
1.00 98.
1.30 99.



DVN

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
0.	0.	1.	3.	4.	6.	7.	7.	7.	6.	
6.	5.	4.	3.	3.	2.	2.	2.	1.	1.	
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	
2.	3.	4.	6.	8.	10.	12.	14.	16.	17.	
18.	19.	21.	27.	37.	53.	74.	99.	127.	161.	
205.	253.	297.	330.	345.	338.	313.	279.	242.	205.	
172.	144.	120.	101.	85.	72.	61.	51.	43.	37.	
34.	32.	31.	30.	29.	27.	26.	25.	24.	23.	
22.	22.	21.	20.	19.	18.	17.	17.	16.	16.	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	345.	261.	99.	41.	4972.
CMS	10.	7.	3.	1.	141.
INCHES		1.28	1.93	2.04	2.04
MM		32.61	49.64	51.80	51.80
AC-FT		129.	197.	205.	205.
THOUS CU M		160.	243.	253.	253.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

1.	1.	1.	1.	1.	1.	1.	0.	0.	0.	
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
0.	1.	2.	3.	7.	10.	12.	13.	13.	12.	
10.	8.	7.	6.	5.	4.	3.	3.	2.	2.	
2.	2.	2.	2.	3.	3.	3.	3.	3.	3.	
4.	5.	7.	10.	14.	18.	22.	26.	29.	31.	
33.	35.	38.	48.	67.	95.	133.	178.	228.	290.	

369.	455.	534.	593.	621.	609.	563.	501.	439.	370.
310.	258.	216.	181.	153.	129.	109.	92.	78.	66.
60.	58.	56.	54.	51.	49.	47.	46.	44.	42.
40.	39.	37.	36.	34.	33.	32.	30.	29.	28.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	621.	470.	179.	75.	8950.
CMS	18.	13.	5.	2.	253.
INCHES		2.31	3.83	3.67	3.67
MM		58.70	89.35	93.24	93.24
AC-FT		233.	354.	370.	370.
THOUS CU M		287.	437.	456.	456.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

1.	1.	1.	1.	1.	1.	1.	1.	1.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	1.	2.	5.	8.	11.	13.	14.	13.	12.
11.	9.	7.	6.	5.	4.	4.	3.	2.	2.
2.	2.	2.	3.	3.	3.	3.	4.	4.	4.
4.	5.	7.	11.	15.	19.	23.	27.	30.	33.
35.	37.	41.	51.	70.	100.	140.	188.	240.	306.
390.	480.	564.	626.	655.	643.	594.	529.	460.	390.
327.	273.	228.	191.	161.	136.	115.	98.	83.	70.
64.	61.	59.	57.	54.	52.	50.	48.	46.	44.
43.	41.	39.	38.	36.	35.	33.	32.	31.	30.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	655.	496.	189.	79.	9447.
CMS	19.	14.	5.	2.	268.
INCHES		2.44	3.71	3.87	3.87
MM		61.96	94.31	98.42	98.42
AC-FT		246.	374.	390.	390.
THOUS CU M		303.	461.	482.	482.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	1.	3.	5.	8.	11.	14.	15.	14.	13.
11.	9.	8.	7.	5.	4.	4.	3.	3.	2.
2.	2.	2.	3.	3.	3.	3.	4.	4.	4.
4.	6.	8.	11.	15.	20.	25.	29.	32.	35.
37.	39.	43.	53.	74.	105.	148.	198.	253.	322.
410.	505.	593.	659.	690.	677.	626.	557.	484.	411.
344.	287.	240.	201.	169.	143.	121.	103.	87.	73.
67.	65.	62.	60.	57.	55.	53.	51.	49.	47.
45.	43.	41.	40.	38.	37.	35.	34.	32.	31.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	690.	522.	199.	83.	9944.
CMS	20.	15.	6.	2.	282.
INCHES		2.57	3.91	4.08	4.08
MM		65.22	99.28	103.60	103.60
AC-FT		259.	394.	411.	411.
THOUS CU M		319.	486.	507.	507.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 5

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	1.	3.	5.	9.	12.	14.	15.	15.	13.
12.	10.	8.	7.	6.	5.	4.	3.	3.	2.
2.	2.	3.	3.	3.	3.	4.	4.	4.	4.
3.	6.	8.	12.	16.	21.	26.	30.	33.	36.
39.	41.	45.	56.	78.	111.	155.	208.	266.	338.
431.	530.	623.	692.	724.	710.	657.	585.	508.	431.
361.	301.	252.	212.	178.	150.	127.	108.	91.	77.
71.	68.	65.	62.	60.	58.	55.	53.	51.	49.
47.	45.	43.	42.	40.	38.	37.	35.	34.	33.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	724.	548.	208.	87.	10441.
CMS	21.	16.	6.	2.	296.
INCHES		2.70	4.10	4.28	4.28
MM		68.48	104.24	108.78	108.78
AC-FT		272.	413.	431.	431.
THOUS CU M		335.	510.	532.	532.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 6

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	1.	3.	6.	9.	13.	15.	16.	16.	14.
12.	10.	9.	7.	6.	5.	4.	3.	3.	2.
2.	2.	3.	3.	3.	4.	4.	4.	4.	4.
5.	6.	9.	12.	17.	22.	27.	32.	35.	38.
40.	42.	47.	59.	81.	115.	152.	218.	278.	354.
451.	556.	653.	725.	759.	744.	688.	613.	532.	452.
378.	316.	264.	222.	186.	157.	133.	113.	96.	81.
74.	71.	68.	65.	63.	60.	58.	56.	53.	51.
49.	47.	45.	44.	42.	40.	39.	37.	36.	34.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	759.	574.	218.	91.	10938.
CMS	21.	16.	6.	3.	310.
INCHES		2.82	4.30	4.49	4.49
MM		71.74	109.21	113.96	113.96
AC-FT		285.	433.	452.	452.
THOUS CU M		351.	534.	558.	558.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 7

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	1.	3.	6.	10.	13.	16.	17.	16.	13.
13.	11.	9.	7.	6.	5.	4.	4.	3.	3.
2.	3.	3.	3.	3.	4.	4.	4.	4.	4.
5.	6.	9.	13.	18.	23.	28.	33.	37.	40.
42.	44.	49.	62.	85.	121.	170.	228.	291.	370.
472.	581.	682.	798.	793.	778.	719.	641.	556.	472.

395.	330.	276.	232.	195.	165.	139.	118.	100.	84.
77.	74.	71.	68.	66.	63.	61.	58.	56.	54.
52.	49.	48.	46.	44.	42.	40.	39.	37.	36.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	793.	600.	228.	95.	11436.
CMS	22.	17.	6.	3.	324.
INCHES		2.95	4.49	4.69	4.69
MM		75.00	114.17	119.14	119.14
AC-FT		297.	453.	473.	473.
THOUS CU M		367.	559.	583.	583.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 8

2.	2.	2.	2.	2.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	2.	6.	13.	21.	28.	34.	37.	35.	32.
28.	24.	20.	16.	13.	11.	9.	8.	6.	6.
5.	5.	6.	7.	7.	8.	8.	9.	9.	10.
11.	14.	19.	28.	39.	50.	62.	72.	80.	86.
92.	97.	107.	134.	185.	264.	369.	495.	633.	805.
1026.	1263.	1484.	1648.	1725.	1692.	1564.	1393.	1209.	1027.
860.	718.	600.	504.	424.	358.	303.	257.	217.	183.
168.	161.	155.	149.	143.	137.	132.	127.	121.	117.
112.	108.	103.	99.	95.	91.	88.	84.	81.	78.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1725.	1304.	496.	207.	24860.
CMS	49.	37.	14.	6.	704.
INCHES		6.42	9.77	10.20	10.20
MM		163.05	248.19	258.99	258.99
AC-FT		647.	984.	1027.	1027.
THOUS CU M		798.	1214.	1267.	1267.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 9

4.	3.	3.	3.	3.	3.	3.	3.	3.	3.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	1.	1.	1.	1.	1.	1.
1.	4.	13.	26.	42.	57.	68.	73.	71.	64.
56.	47.	39.	33.	27.	22.	19.	15.	13.	11.
11.	11.	12.	13.	15.	16.	17.	18.	19.	19.
21.	27.	39.	55.	77.	101.	124.	143.	159.	173.
184.	193.	214.	267.	369.	527.	738.	990.	1265.	1610.
2051.	2525.	2967.	3297.	3449.	3383.	3128.	2786.	2419.	2054.
1720.	1435.	1201.	1007.	847.	715.	606.	514.	435.	366.
336.	323.	310.	298.	286.	274.	264.	253.	243.	233.
224.	215.	207.	198.	191.	183.	176.	169.	162.	156.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3449.	2608.	993.	414.	49720.
CMS	98.	74.	28.	12.	1408.
INCHES		12.84	19.54	20.39	20.39
MM		326.10	496.39	517.98	517.98
AC-FT		1293.	1969.	2055.	2055.
THOUS CU M		1595.	2429.	2534.	2534.

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH, SUBWATERSHED NO. 2 - SNYDER METHOD

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	3.32	0.00	5.21	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	20.00	111.00	122.00	133.00	143.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.01

UNIT HYDROGRAPH DATA

TP= 3.13 CP=0.63 NTA= 0

RECESSION DATA

STRTQ= -2.00 QRCSN= -0.10 RTIOR= 1.90

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 7.29 AND R= 5.51 INTERVALS

UNIT HYDROGRAPH 34 END-OF-PERIOD ORDINATES, LAG= 3.11 HOURS, CP= 0.64 VOL= 1.00

26.	94.	186.	286.	373.	426.	440.	404.	341.	284.	
237.	197.	165.	137.	114.	95.	80.	66.	55.	46.	
38.	32.	27.	22.	19.	15.	13.	11.	9.	7.	
6.	5.	4.	4.							

END-OF-PERIOD FLOW

MO. DA	HR. MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO. DA	HR. MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	0.30	1	0.00	0.00	0.00	6.	1.02	6.30	61	0.15	0.15	0.00	219.
1.01	1.00	2	0.00	0.00	0.00	7.	1.02	7.00	62	0.15	0.15	0.00	233.
1.01	1.30	3	0.00	0.00	0.00	7.	1.02	7.30	63	0.15	0.15	0.00	254.
1.01	2.00	4	0.00	0.00	0.00	8.	1.02	8.00	64	0.15	0.15	0.00	283.
1.01	2.30	5	0.00	0.00	0.00	10.	1.02	8.30	65	0.15	0.15	0.00	319.
1.01	3.00	6	0.00	0.00	0.00	11.	1.02	9.00	66	0.15	0.15	0.00	358.
1.01	3.30	7	0.00	0.00	0.00	13.	1.02	9.30	67	0.15	0.15	0.00	399.
1.01	4.00	8	0.00	0.00	0.00	15.	1.02	10.00	68	0.15	0.15	0.00	437.
1.01	4.30	9	0.00	0.00	0.00	16.	1.02	10.30	69	0.15	0.15	0.00	468.
1.01	5.00	10	0.00	0.00	0.00	17.	1.02	11.00	70	0.15	0.15	0.00	495.
1.01	5.30	11	0.00	0.00	0.00	18.	1.02	11.30	71	0.15	0.15	0.00	517.
1.01	6.00	12	0.00	0.00	0.00	19.	1.02	12.00	72	0.15	0.15	0.00	535.
1.01	6.30	13	0.01	0.01	0.00	19.	1.02	12.30	73	0.89	0.89	0.00	570.
1.01	7.00	14	0.01	0.01	0.00	20.	1.02	13.00	74	0.89	0.89	0.00	632.
1.01	7.30	15	0.01	0.01	0.00	22.	1.02	13.30	75	1.07	1.07	0.00	805.
1.01	8.00	16	0.01	0.01	0.00	24.	1.02	14.00	76	1.07	1.07	0.00	1043.
1.01	8.30	17	0.01	0.01	0.00	27.	1.02	14.30	77	1.33	1.33	0.00	1366.
1.01	9.00	18	0.01	0.01	0.00	30.	1.02	15.00	78	1.33	1.33	0.00	1764.
1.01	9.30	19	0.01	0.01	0.00	33.	1.02	15.30	79	1.62	1.62	0.00	2218.

1.01	10.00	20	0.01	0.01	0.00	36.	1.02	16.00	80	3.13	3.13	0.00	2791.
1.01	10.30	21	0.01	0.01	0.00	38.	1.02	16.30	81	1.24	1.24	0.00	3507.
1.01	11.00	22	0.01	0.01	0.00	40.	1.02	17.00	82	1.24	1.24	0.00	4275.
1.01	11.30	23	0.01	0.01	0.00	41.	1.02	17.30	83	0.98	0.98	0.00	5013.
1.01	12.00	24	0.01	0.01	0.00	43.	1.02	18.00	84	0.98	0.98	0.00	5615.
1.01	12.30	25	0.07	0.07	0.00	45.	1.02	18.30	85	0.09	0.09	0.00	5972.
1.01	13.00	26	0.07	0.07	0.00	51.	1.02	19.00	86	0.09	0.09	0.00	6031.
1.01	13.30	27	0.08	0.08	0.00	63.	1.02	19.30	87	0.09	0.09	0.00	5751.
1.01	14.00	28	0.08	0.08	0.00	80.	1.02	20.00	88	0.09	0.09	0.00	5240.
1.01	14.30	29	0.10	0.10	0.00	105.	1.02	20.30	89	0.09	0.09	0.00	4637.
1.01	15.00	30	0.10	0.10	0.00	135.	1.02	21.00	90	0.09	0.09	0.00	4058.
1.01	15.30	31	0.12	0.12	0.00	169.	1.02	21.30	91	0.09	0.09	0.00	3482.
1.01	16.00	32	0.39	0.39	0.00	212.	1.02	22.00	92	0.09	0.09	0.00	2969.
1.01	16.30	33	0.09	0.09	0.00	265.	1.02	22.30	93	0.09	0.09	0.00	2538.
1.01	17.00	34	0.09	0.09	0.00	323.	1.02	23.00	94	0.09	0.09	0.00	2179.
1.01	17.30	35	0.07	0.07	0.00	379.	1.02	23.30	95	0.09	0.09	0.00	1879.
1.01	18.00	36	0.07	0.07	0.00	424.	1.03	0.00	96	0.09	0.09	0.00	1629.
1.01	18.30	37	0.01	0.01	0.00	450.	1.03	0.30	97	0.00	0.00	0.00	1418.
1.01	19.00	38	0.01	0.01	0.00	455.	1.03	1.00	98	0.00	0.00	0.00	1236.
1.01	19.30	39	0.01	0.01	0.00	434.	1.03	1.30	99	0.00	0.00	0.00	1074.
1.01	20.00	40	0.01	0.01	0.00	393.	1.03	2.00	100	0.00	0.00	0.00	928.
1.01	20.30	41	0.01	0.01	0.00	351.	1.03	2.30	101	0.00	0.00	0.00	795.
1.01	21.00	42	0.01	0.01	0.00	306.	1.03	3.00	102	0.00	0.00	0.00	673.
1.01	21.30	43	0.01	0.01	0.00	263.	1.03	3.30	103	0.00	0.00	0.00	595.
1.01	22.00	44	0.01	0.01	0.00	224.	1.03	4.00	104	0.00	0.00	0.00	571.
1.01	22.30	45	0.01	0.01	0.00	192.	1.03	4.30	105	0.00	0.00	0.00	548.
1.01	23.00	46	0.01	0.01	0.00	165.	1.03	5.00	106	0.00	0.00	0.00	526.
1.01	23.30	47	0.01	0.01	0.00	142.	1.03	5.30	107	0.00	0.00	0.00	506.
1.02	0.00	48	0.01	0.01	0.00	123.	1.03	6.00	108	0.00	0.00	0.00	489.
1.02	0.30	49	0.06	0.06	0.00	109.	1.03	6.30	109	0.00	0.00	0.00	466.
1.02	1.00	50	0.06	0.06	0.00	101.	1.03	7.00	110	0.00	0.00	0.00	448.
1.02	1.30	51	0.06	0.06	0.00	99.	1.03	7.30	111	0.00	0.00	0.00	430.
1.02	2.00	52	0.06	0.06	0.00	109.	1.03	8.00	112	0.00	0.00	0.00	413.
1.02	2.30	53	0.06	0.06	0.00	117.	1.03	8.30	113	0.00	0.00	0.00	396.
1.02	3.00	54	0.06	0.06	0.00	133.	1.03	9.00	114	0.00	0.00	0.00	381.
1.02	3.30	55	0.06	0.06	0.00	150.	1.03	9.30	115	0.00	0.00	0.00	366.
1.02	4.00	56	0.06	0.06	0.00	167.	1.03	10.00	116	0.00	0.00	0.00	351.
1.02	4.30	57	0.06	0.06	0.00	181.	1.03	10.30	117	0.00	0.00	0.00	337.
1.02	5.00	58	0.06	0.06	0.00	193.	1.03	11.00	118	0.00	0.00	0.00	324.
1.02	5.30	59	0.06	0.06	0.00	202.	1.03	11.30	119	0.00	0.00	0.00	311.
1.02	6.00	60	0.06	0.06	0.00	210.	1.03	12.00	120	0.00	0.00	0.00	298.
									SUM	22.88	22.88	0.00	102435.
										(581.)	(581.)	(0.)	(2900.63)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6031.	4707.	1890.	852.	102284.
CMS	171.	133.	54.	24.	2896.
INCHES		13.19	21.19	23.88	23.88
MM		334.98	538.11	606.62	606.62
AC-FT		2334.	3749.	4227.	4227.
THOUS CU M		2879.	4625.	5213.	5213.

OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

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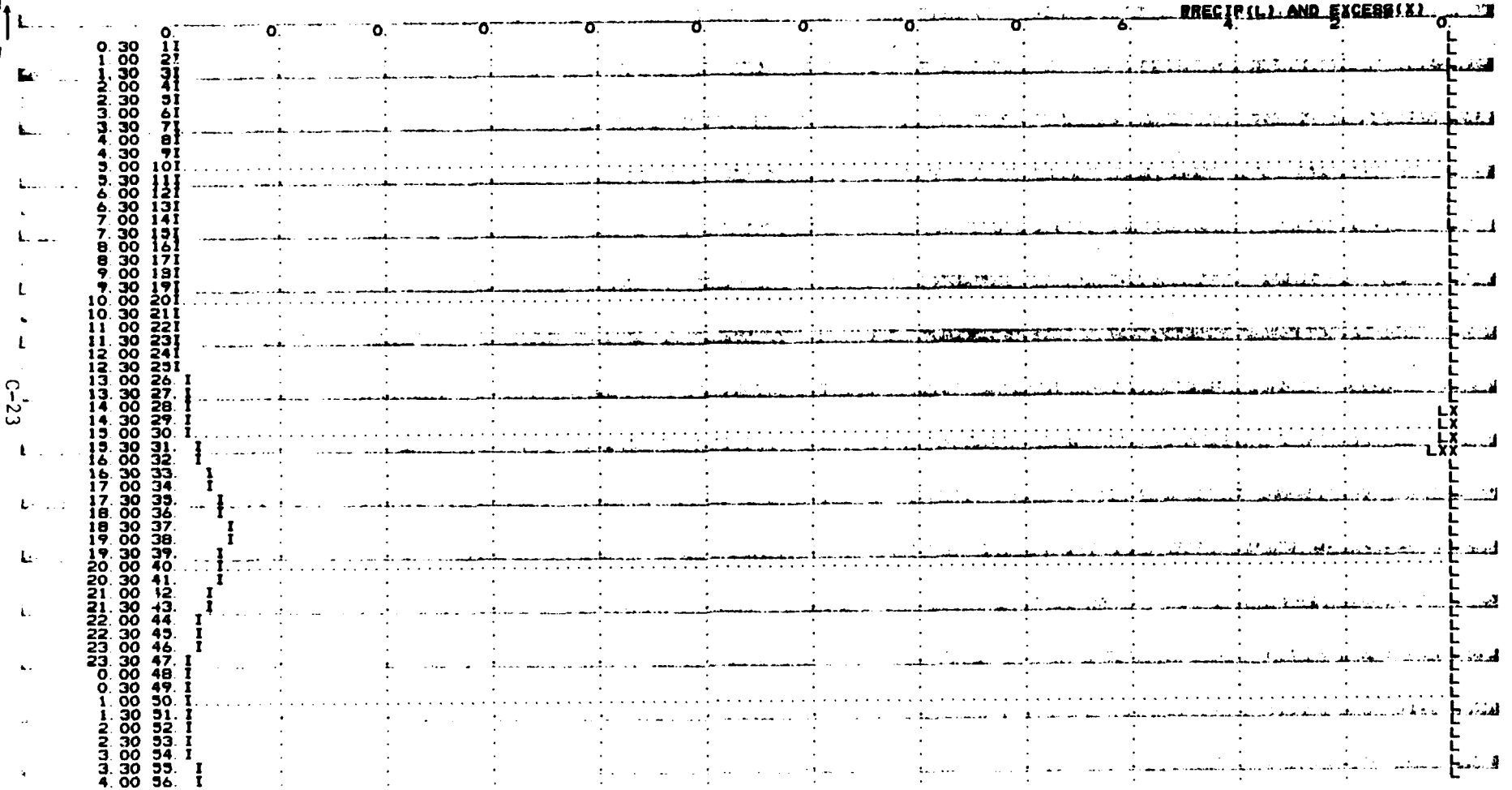
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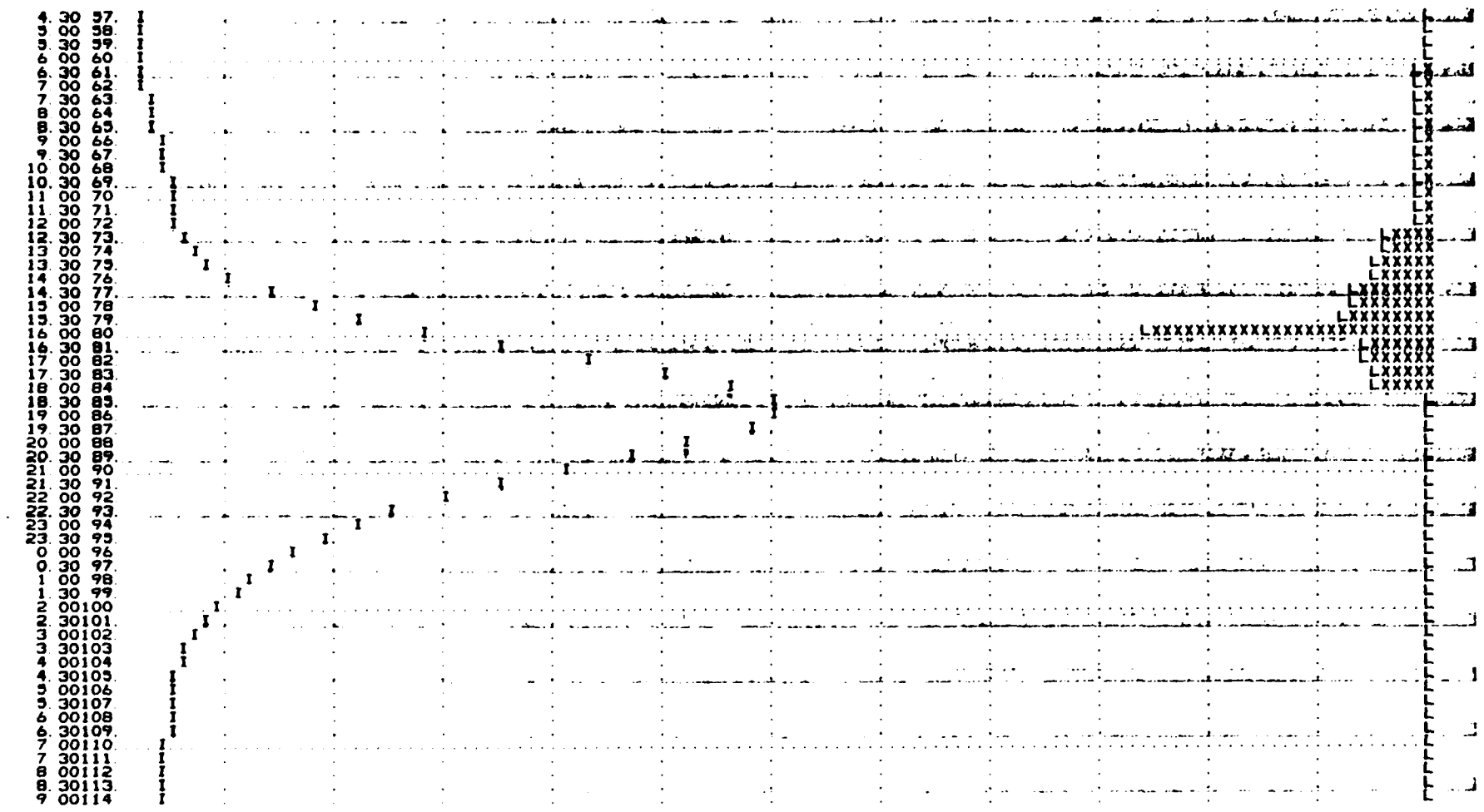
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7 30111
8 00112
8 30113
9 00114

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 9 30119     I
10 00119     I
10 30117    I
11 00118    I
11 30119    I
12 00120    I
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OVN

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

1	1	1	1	1	1	1	1	2	2
2	2	2	2	2	2	3	3	3	4
4	4	4	4	5	5	6	8	10	13
17	21	27	32	38	42	45	45	43	40
35	31	26	22	19	16	14	12	11	10
10	11	12	13	15	17	18	19	20	21
22	23	25	28	32	36	40	44	47	49
52	54	57	65	81	104	137	176	222	279
351	428	501	562	597	603	579	524	466	406
348	297	254	218	188	163	142	124	107	93
79	67	59	57	55	53	51	49	47	45
43	41	40	38	37	35	34	32	31	30

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	603.	471.	189.	85.	10228.
CMS	17.	13.	5.	2.	290.
INCHES		1.32	2.12	2.39	2.39
MM		33.50	53.81	60.66	60.66
AC-FT		233.	375.	423.	423.
THOUS CU M		288.	462.	521.	521.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

1.	1.	1.	1.	2.	2.	2.	3.	3.	3.
3.	3.	3.	4.	4.	4.	5.	5.	6.	6.
7.	7.	7.	8.	8.	9.	11.	14.	19.	24.
30.	38.	48.	58.	68.	76.	81.	82.	78.	71.
63.	55.	47.	40.	35.	30.	26.	22.	20.	18.
18.	19.	21.	24.	27.	30.	33.	35.	36.	38.
39.	42.	46.	51.	57.	64.	72.	79.	84.	89.
93.	96.	103.	117.	145.	188.	246.	318.	399.	502.
631.	770.	902.	1011.	1075.	1085.	1035.	943.	838.	730.
627.	534.	457.	392.	338.	293.	255.	222.	193.	167.
143.	121.	107.	103.	99.	95.	91.	87.	84.	81.
77.	74.	71.	69.	66.	63.	61.	58.	56.	54.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1085.	847.	340.	153.	18411.
CMS	31.	24.	10.	4.	521.
INCHES		2.37	3.81	4.30	4.30
MM		60.30	96.86	109.19	109.19
AC-FT		420.	675.	761.	761.
THOUS CU M		518.	832.	938.	938.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

1.	1.	1.	2.	2.	2.	2.	3.	3.	3.
3.	4.	4.	4.	4.	5.	5.	6.	6.	7.
7.	8.	8.	8.	9.	10.	12.	15.	20.	26.
32.	40.	50.	61.	72.	81.	86.	86.	82.	75.
67.	58.	50.	43.	36.	31.	27.	23.	21.	19.
19.	20.	22.	25.	29.	32.	34.	37.	38.	40.
42.	44.	48.	54.	61.	68.	76.	83.	89.	94.
98.	102.	108.	124.	153.	198.	260.	335.	421.	530.
666.	812.	953.	1067.	1135.	1146.	1093.	996.	883.	771.
662.	564.	482.	414.	357.	309.	269.	235.	204.	176.
151.	128.	113.	108.	104.	100.	96.	92.	89.	85.
82.	78.	75.	72.	69.	67.	64.	61.	59.	57.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1146.	894.	359.	162.	19434.
CMS	32.	25.	10.	5.	550.
INCHES		2.81	4.03	4.94	4.94
MM		63.65	102.24	115.26	115.26
AC-FT		443.	712.	803.	803.
THOUS CU M		547.	879.	991.	991.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

1.	1.	1.	2.	2.	2.	3.	3.	3.	3.
4.	4.	4.	5.	5.	6.	6.	6.	7.	7.
8.	8.	8.	9.	9.	10.	13.	16.	21.	27.
34.	42.	53.	65.	76.	85.	90.	91.	87.	79.
70.	61.	53.	45.	38.	33.	28.	25.	22.	20.
20.	21.	23.	27.	30.	33.	36.	39.	40.	42.
44.	47.	51.	57.	64.	72.	80.	87.	94.	99.
103.	107.	114.	130.	161.	209.	273.	353.	444.	558.
701.	855.	1003.	1123.	1194.	1206.	1150.	1048.	931.	812.
696.	594.	508.	436.	376.	326.	284.	247.	219.	186.
159.	135.	119.	114.	110.	105.	101.	97.	93.	90.
86.	83.	79.	76.	73.	70.	67.	65.	62.	60.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1206.	941.	378.	170.	20457.
CMS	34.	27.	11.	5.	579.
INCHES		2.64	4.24	4.78	4.78
MM		67.00	107.62	121.32	121.32
AC-FT		467.	750.	845.	845.
THOUS CU M		576.	925.	1043.	1043.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 5

1.	1.	2.	2.	2.	2.	3.	3.	3.	4.
4.	4.	4.	4.	5.	5.	6.	6.	7.	7.
8.	8.	9.	9.	9.	11.	13.	17.	22.	28.
35.	44.	56.	68.	79.	89.	95.	96.	91.	83.
74.	64.	55.	47.	40.	35.	30.	26.	23.	21.
21.	22.	25.	28.	32.	35.	38.	40.	43.	44.
46.	49.	53.	59.	67.	75.	84.	92.	98.	104.
109	112	120.	137.	169.	219.	287.	370.	466.	586.
737.	898.	1053.	1179.	1254.	1266.	1208.	1100.	978.	852.
731.	624.	533.	458.	393.	342.	298.	259.	226.	195.
167.	141.	125.	120.	115.	111.	106.	102.	98.	94.
90.	87.	83.	80.	77.	74.	71.	68.	65.	63.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1266.	988.	397.	179.	21480.
CMS	36.	28.	11.	5.	608.
INCHES		2.77	4.45	5.02	5.02
MM		70.35	113.00	127.39	127.39
AC-FT		490.	787.	888.	888.
THOUS CU M		605.	971.	1095.	1095.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 6

1.	1.	2.	2.	2.	2.	3.	3.	4.	4.
4.	4.	4.	4.	5.	5.	6.	7.	7.	8.
8.	9.	9.	9.	10.	11.	14.	18.	23.	30.
37.	47.	58.	71.	83.	93.	99.	100.	93.	87.
77.	67.	58.	49.	42.	36.	31.	27.	24.	22.
22.	23.	26.	29.	33.	37.	40.	42.	43.	46.
48.	51.	56.	62.	70.	79.	88.	96.	103.	109.
114.	118.	125.	143.	177.	229.	301.	388.	488.	614.
772.	941.	1103.	1235.	1314.	1327.	1265.	1153.	1024.	893.
766.	633.	558.	479.	413.	358.	312.	272.	236.	204.
175.	148.	131.	126.	121.	116.	111.	107.	103.	98.
95.	91.	87.	84.	80.	77.	74.	71.	68.	66.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1327.	1036.	416.	188.	22502.
CMS	38.	29.	12.	5.	637.
INCHES		2.90	4.66	5.25	5.25
MM		73.70	118.38	133.46	133.46
AC-FT		513.	825.	930.	930.
THOUS CU M		633.	1017.	1147.	1147.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 7

1.	2.	2.	2.	2.	3.	3.	3.	4.	4.
4.	4.	4.	5.	5.	6.	6.	7.	8.	8.
9.	9.	10.	10.	10.	12.	14.	19.	24.	31.
39.	49.	61.	74.	87.	97.	104.	105.	100.	91.
81.	70.	60.	52.	44.	38.	33.	28.	25.	23.
23.	24.	27.	31.	35.	38.	42.	44.	47.	48.
50.	54.	58.	65.	73.	82.	92.	100.	108.	114.
119.	123.	131.	150.	185.	240.	314.	406.	510.	642.
807.	983.	1153.	1291.	1374.	1387.	1323.	1205.	1071.	933.
801.	683.	584.	501.	432.	375.	326.	284.	247.	214.
183.	155.	137.	131.	126.	121.	116.	112.	107.	103.
99.	95.	91.	88.	84.	81.	78.	74.	71.	69.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1387.	1083.	435.	196.	23525.
CMS	39.	31.	12.	6.	666.
INCHES		3.03	4.87	5.49	5.49
MM		77.04	123.76	139.52	139.52
AC-FT		537.	862.	972.	972.
THOUS CU M		662.	1064.	1199.	1199.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 8

3.	3.	4.	4.	5.	6.	7.	7.	8.	9.

9.	9.	10.	10.	11.	12.	13.	15.	16.	18.
19.	20.	21.	21.	23.	26.	31.	40.	52.	67.
84.	106.	133.	162.	189.	212.	225.	227.	217.	198.
176.	153.	131.	112.	96.	82.	71.	62.	54.	50.
50.	53.	59.	64.	75.	84.	91.	96.	101.	105.
110.	117.	127.	141.	159.	179.	200.	218.	234.	247.
258.	268.	285.	326.	403.	521.	683.	882.	1109.	1395.
1754.	2138.	2507.	2808.	2986.	3015.	2876.	2620.	2328.	2029.
1741.	1485.	1269.	1089.	939.	814.	709.	618.	537.	464.
397.	337.	297.	285.	274.	263.	253.	243.	233.	224.
215.	206.	198.	190.	183.	175.	169.	162.	155.	149.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3013.	2353.	945.	426.	5142.
CMS	85.	67.	27.	12.	1448.
INCHES		6.59	10.59	11.94	11.94
MM		167.49	269.05	303.31	303.31
AC-FT		1167.	1875.	2113.	2113.
THOUS CU M		1439.	2312.	2607.	2607.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 9

6.	7.	7.	8.	10.	11.	13.	15.	16.	17.
18.	19.	19.	20.	22.	24.	27.	30.	33.	36.
38.	40.	41.	43.	45.	51.	63.	80.	105.	135.
169.	212.	265.	323.	379.	424.	450.	455.	434.	395.
351.	306.	263.	224.	192.	165.	142.	123.	109.	101.
99.	105.	117.	133.	150.	167.	181.	193.	202.	210.
219.	233.	254.	283.	319.	358.	399.	437.	468.	499.
517.	535.	570.	652.	805.	1043.	1366.	1764.	2218.	2791.
3507.	4275.	5013.	5615.	5972.	6031.	5751.	5240.	4657.	4058.
3482.	2969.	2538.	2179.	1879.	1629.	1418.	1236.	1074.	928.
795.	673.	595.	571.	548.	526.	506.	485.	466.	448.
430.	413.	396.	381.	366.	351.	337.	324.	311.	298.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6031.	4707.	1890.	852.	102284.
CMS	171.	133.	54.	24.	2896.
INCHES		13.19	21.19	23.88	23.88
MM		334.98	538.10	606.61	606.61
AC-FT		2334.	3749.	4227.	4227.
THOUS CU M		2879.	4625.	5213.	5213.

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COMBINE HYDROGRAPHS

INFLOW HYDROGRAPHS - SUBWATERSHEDS NO. 1 & NO. 2 COMBINED

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	2	0	0	0	0	1	0	0

SUM OF 2 HYDROGRAPHS AT 1 PLAN 1 RTIO 1

1.	1.	1.	1.	1.	1.	2.	2.	2.	2.
2.	2.	2.	2.	2.	3.	3.	3.	3.	4.

4.	4.	4.	4.	5.	5.	6.	8.	11.	14.
17.	22.	28.	35.	42.	48.	52.	53.	50.	45.
41.	35.	30.	26.	22.	19.	16.	14.	12.	11.
11.	12.	13.	15.	17.	18.	20.	21.	22.	23.
24.	26.	29.	34.	40.	46.	52.	58.	63.	67.
70.	73.	78.	92.	117.	157.	210.	275.	348.	440.
536.	680.	798.	891.	942.	941.	888.	803.	708.	611.
520.	440.	374.	319.	273.	234.	202.	175.	151.	129.
113.	100.	90.	82.	83.	80.	77.	74.	71.	68.
65.	63.	60.	58.	56.	53.	51.	49.	47.	45.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	942.	732.	288.	127.	19200.
CMS	27.	21.	8.	4.	430.
INCHES		1.31	2.06	2.26	2.26
MM		33.18	52.26	57.45	57.45
AC-FT		363.	871.	628.	628.
THOUS CU M		447.	705.	775.	775.

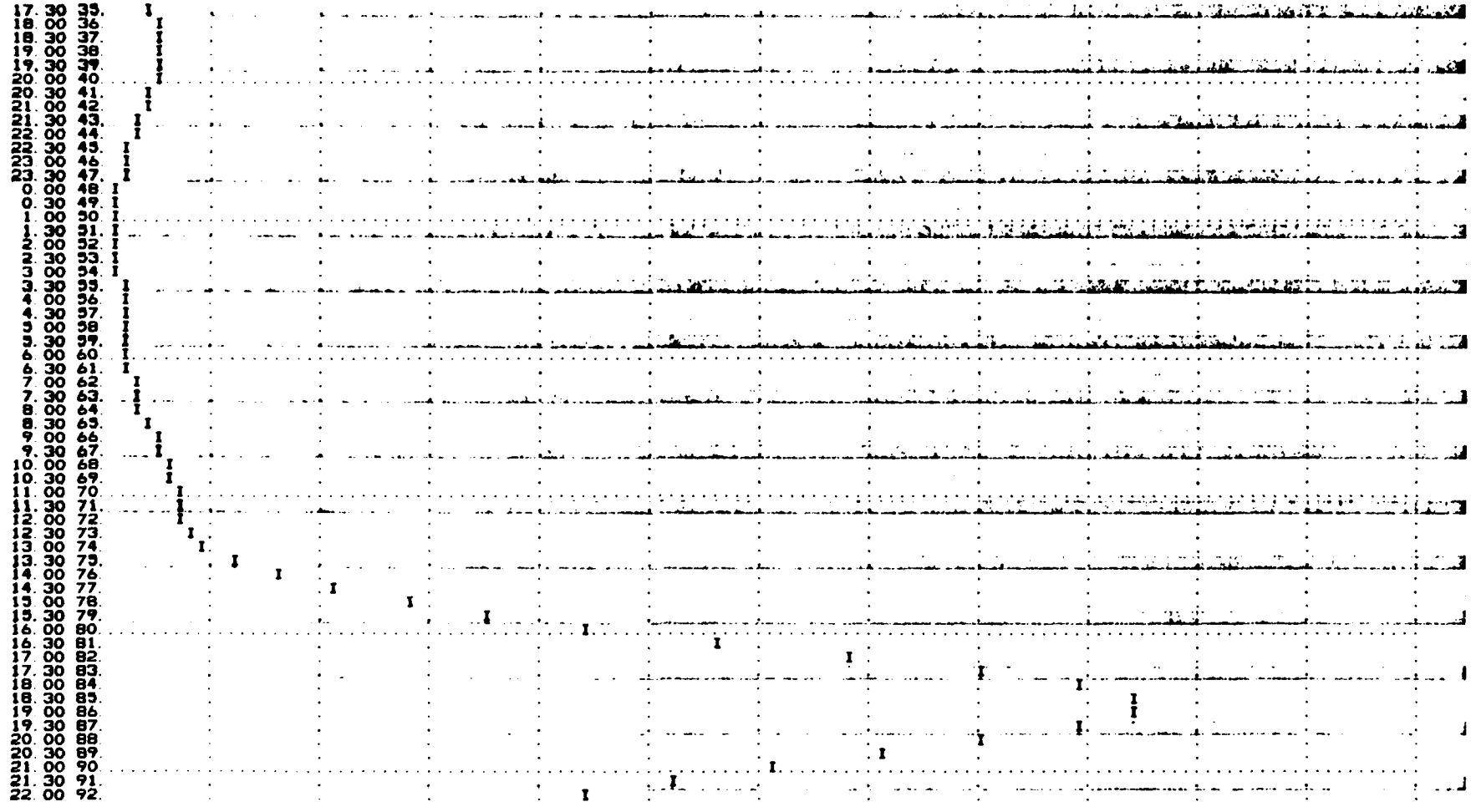
OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

0. 100. 200. 300. 400. 500. 600. 700. 800. 900. 1000. 0. 0.

0.30	11	I
1.00	21	I
1.30	31	I
2.00	41	I
2.30	51	I
3.00	61	I
3.30	71	I
4.00	81	I
4.30	91	I
5.00	101	I
5.30	111	I
6.00	121	I
6.30	131	I
7.00	141	I
7.30	151	I
8.00	161	I
8.30	171	I
9.00	181	I
9.30	191	I
10.00	201	I
10.30	211	I
11.00	221	I
11.30	231	I
12.00	241	I
12.30	251	I
13.00	26.	I
13.30	27.	I
14.00	28.	I
14.30	29.	I
15.00	30.	I
15.30	31.	I
16.00	32.	I
16.30	33.	I
17.00	34.	I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22. 00 44.
22. 30 45.
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23. 30 47.
0. 00 48.
0. 30 49.
1. 00 50.
1. 30 51.
2. 00 52.
2. 30 53.
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4. 00 56.
4. 30 57.
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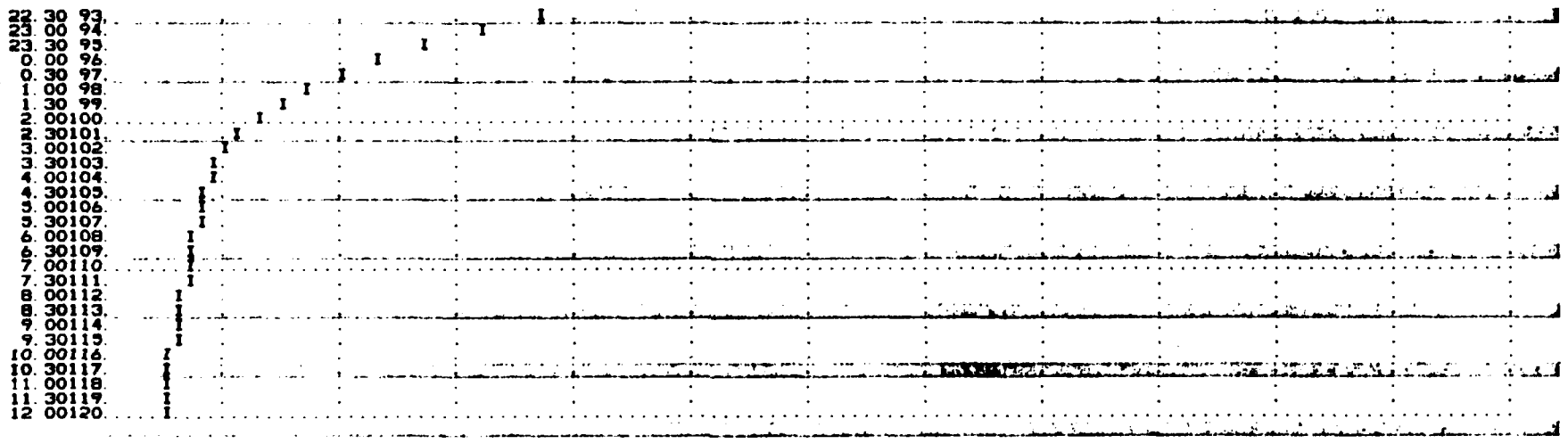
22. 00 92.



OVN

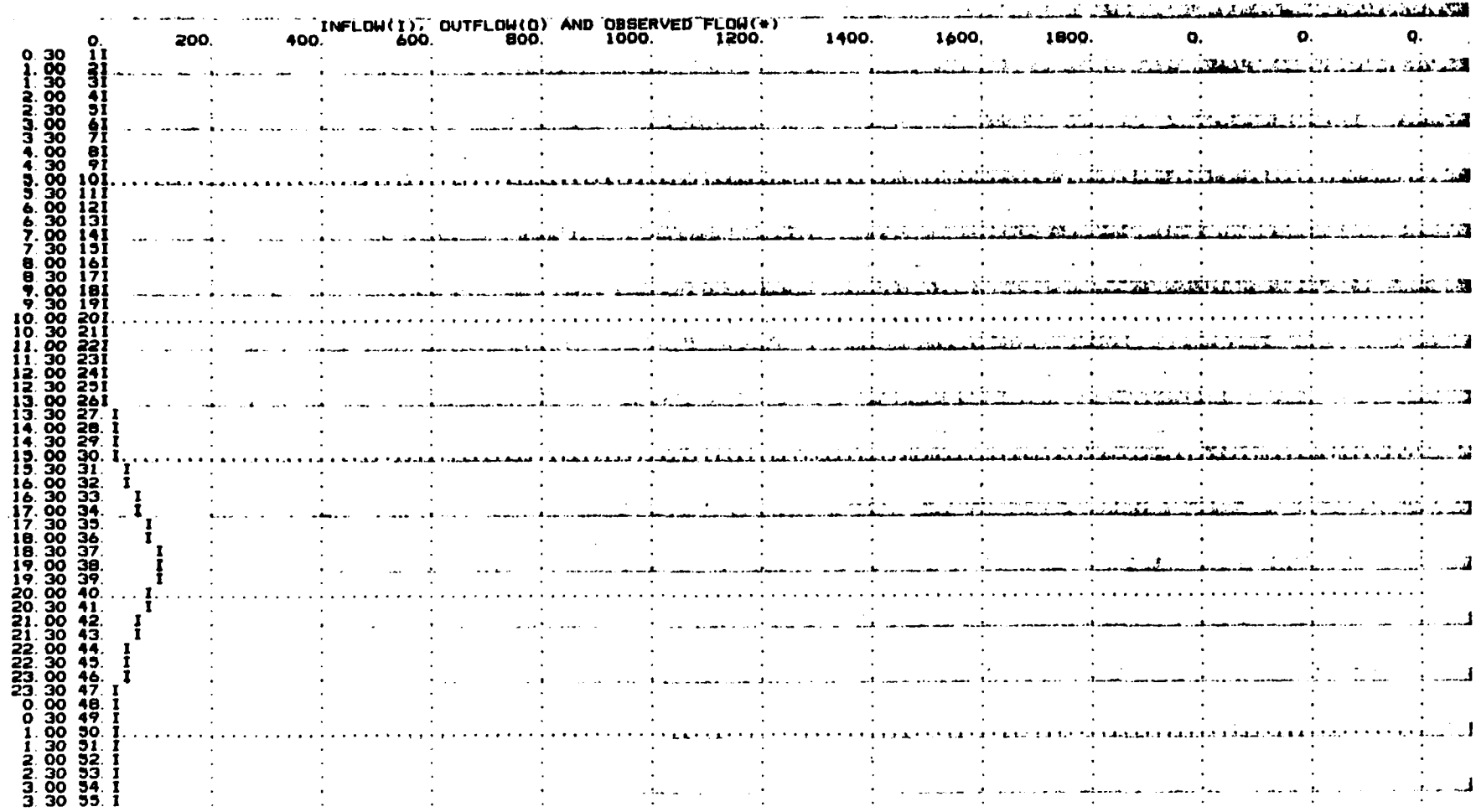
SUM OF 2 HYDROGRAPHS AT 1 PLAN 1 RTIO 2

2.	2.	2.	2.	2.	3.	3.	3.	3.	4.
4.	4.	4.	4.	4.	5.	5.	6.	6.	7.
7.	7.	8.	8.	8.	9.	12.	15.	19.	24.
31.	39.	50.	63.	76.	87.	93.	95.	91.	83.
73.	64.	54.	46.	39.	34.	29.	25.	22.	20.
20.	21.	23.	26.	30.	33.	36.	38.	40.	41.
43.	47.	53.	61.	71.	83.	94.	104.	113.	120.
126.	131.	141.	166.	211.	283.	379.	496.	627.	792.
1001.	1224.	1436.	1604.	1696.	1694.	1598.	1445.	1274.	1100.
936.	793.	673.	573.	491.	422.	364.	315.	272.	233.
204.	179.	163.	156.	150.	144.	138.	133.	128.	123.
118.	113.	109.	104.	100.	96.	92.	89.	85.	82.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1696.	1317.	519.	228.	27361.
CMS	48.	37.	15.	6.	775.
INCHES		2.35	3.70	4.07	4.07
MM		59.72	94.07	103.40	103.40
AC-FT		653.	1029.	1131.	1131.
THOUS CU M		805.	1269.	1395.	1395.

OVF

STATION 1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1 30 31 I
2 00 41 I
2 30 51 I
3 00 61 I
3 30 71 I
4 00 81 I
4 30 91 I
5 00 101 I
5 30 111 I
6 00 121 I
6 30 131 I
7 00 141 I
7 30 151 I
8 00 161 I
8 30 171 I
9 00 181 I
9 30 191 I
10 00 201 I
10 30 211 I
11 00 221 I
11 30 231 I
12 00 241 I
12 30 251 I
13 00 261 I
13 30 27. I
14 00 28. I
14 30 29. I
15 00 30. I
15 30 31. I
16 00 32. I
16 30 33. I
17 00 34. I
17 30 35. I
18 00 36. I
18 30 37. I
19 00 38. I
19 30 39. I
20 00 40. I
20 30 41. I
21 00 42. I
21 30 43. I
22 00 44. I
22 30 45. I
23 00 46. I
23 30 47. I
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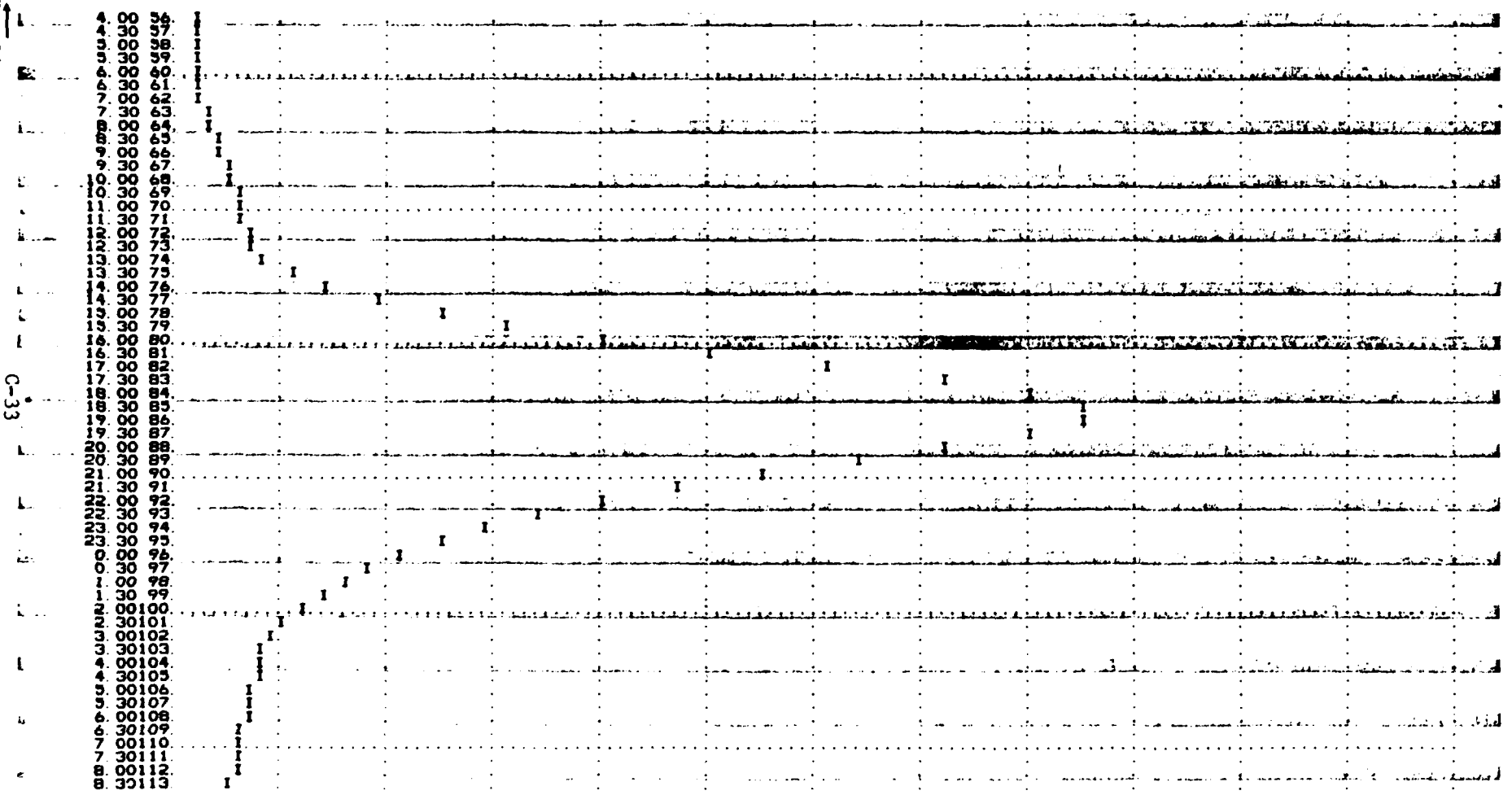
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4:30105
5:00106
5:30107
6:00108
6:30109
7:00110
7:30111
8:00112
8:30113

```
 9.00'14.    1
 9.30'15     1
10.00116     1
10.30117     1
11.00118     1
11.30119     1
12.00120     1
```

DVN

SUM OF 2 HYDROGRAPHS AT 1 PLAN 1 RTIO 3

2.	2.	2.	2.	2.	3.	3.	3.	4.	4.
4.	4.	4.	4.	5.	5.	5.	6.	7.	7.
8.	8.	8.	8.	9.	10.	12.	16.	20.	26.
32.	41.	53.	66.	80.	91.	99.	100.	96.	87.
77.	67.	57.	49.	42.	36.	31.	26.	23.	21.
21.	22.	24.	28.	31.	35.	38.	40.	42.	44.
46.	49.	56.	64.	75.	87.	99.	110.	119.	127.
133.	138.	149.	175.	223.	298.	400.	523.	662.	836.
1056.	1292.	1516.	1693.	1790.	1789.	1687.	1529.	1344.	1161.
988.	837.	710.	605.	518.	445.	384.	332.	287.	246.
215.	189.	172.	165.	158.	152.	146.	140.	135.	129.
124.	119.	115.	110.	106.	101.	97.	94.	90.	86.

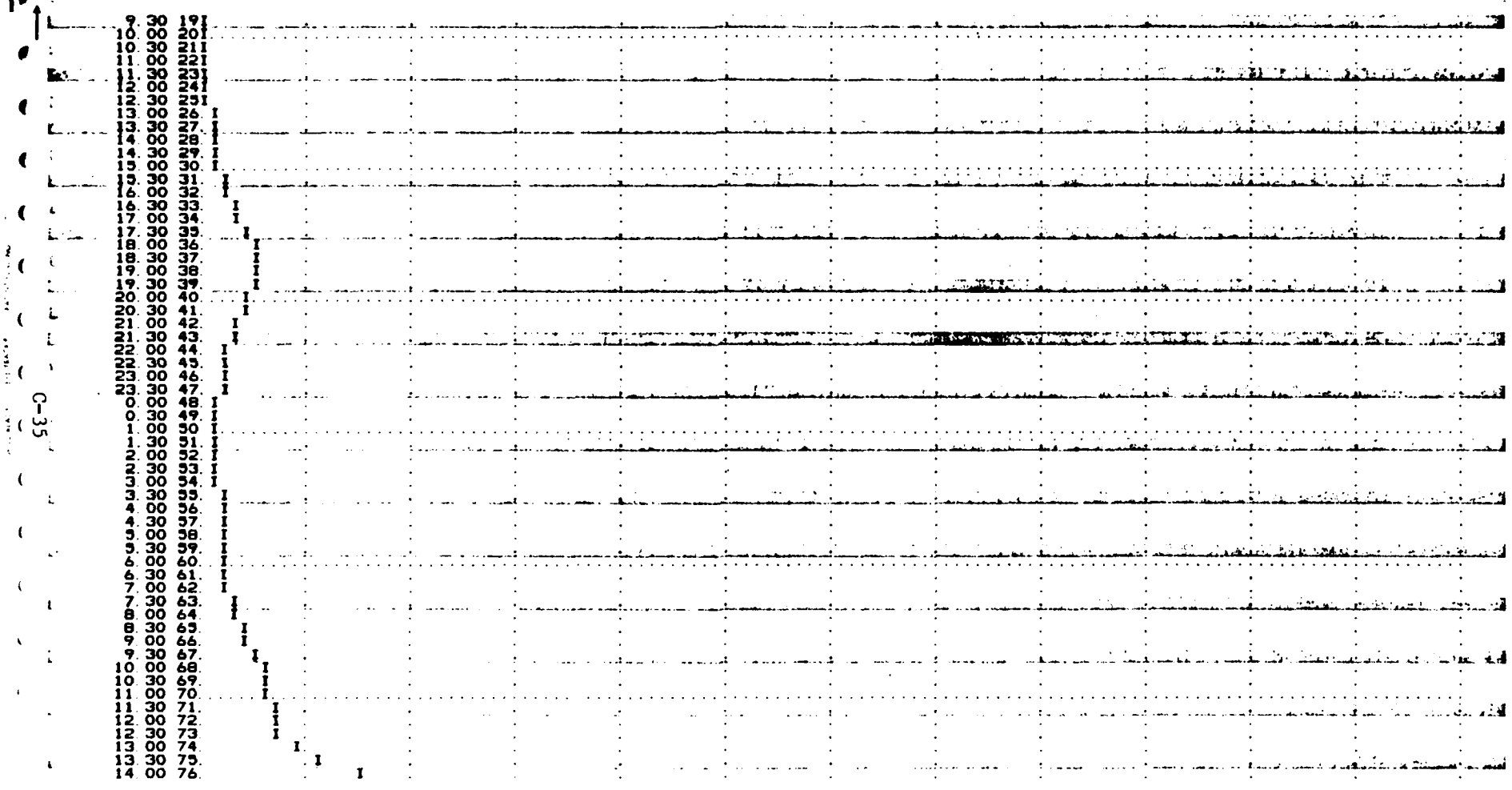
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1790.	1390.	387.	241.	28881.
CMS	51.	39.	16.	7	818.
INCHES		2.48	3.91	4.30	4.30
MM		63.03	99.30	109.15	109.15
AC-FT		689.	1086.	1193.	1193.
THOUS CU M		850.	1339.	1472.	1472.

DVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0.	200.	400.	600.	800.	1000.	1200.	1400.	1600.	1800.	0.	0.	0.
0.30	11												
1.00	21												
1.30	31												
2.00	41												
2.30	51												
3.00	61												
3.30	71												
4.00	81												
4.30	91												
5.00	101												
5.30	111												
6.00	121												
6.30	131												
7.00	141												
7.30	151												
8.00	161												
8.30	171												
9.00	181												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12:30 25
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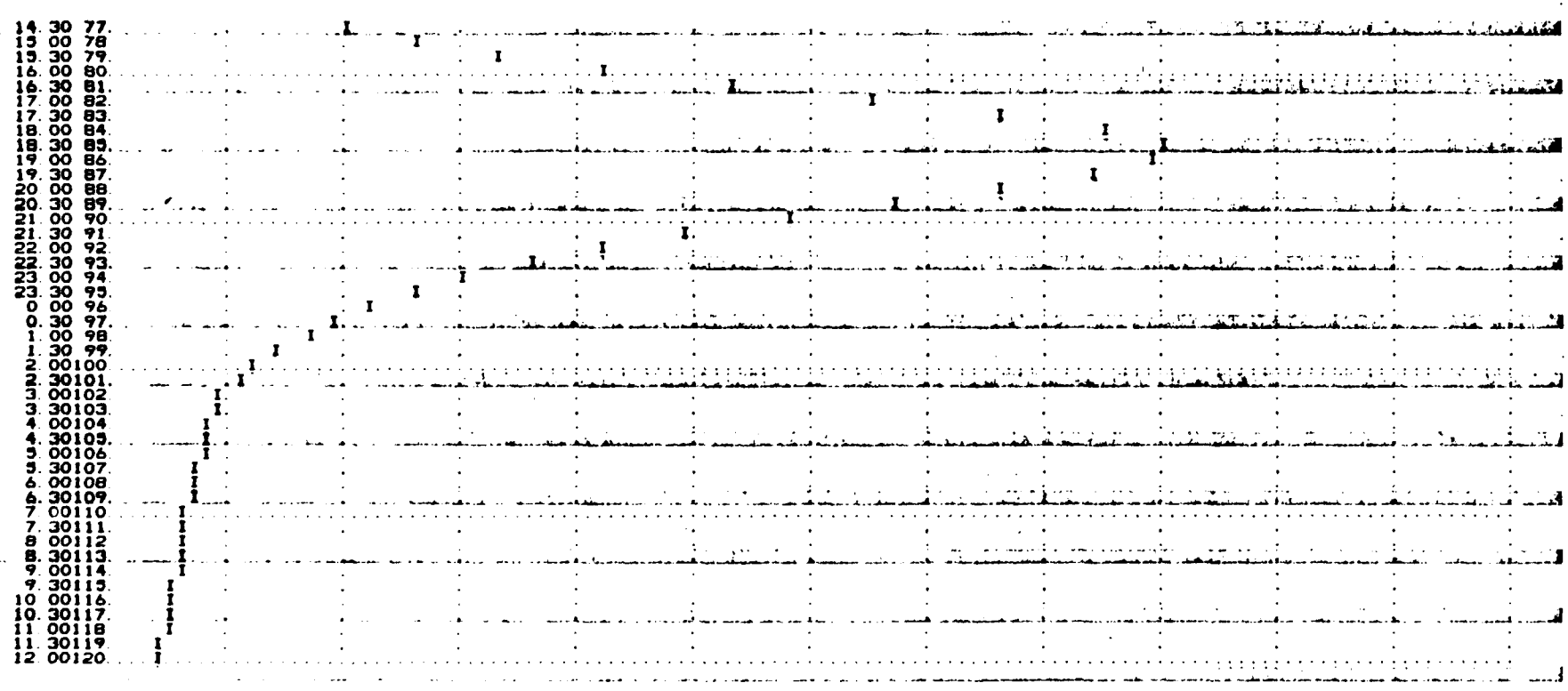
14:00 76



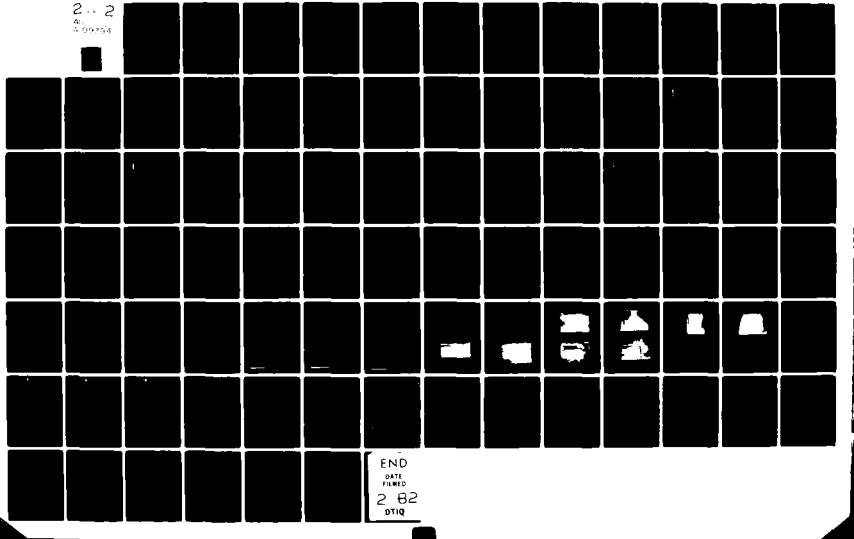
OVN

SUM OF 2 HYDROGRAPHS AT 1 PLAN 1 RTIO 4

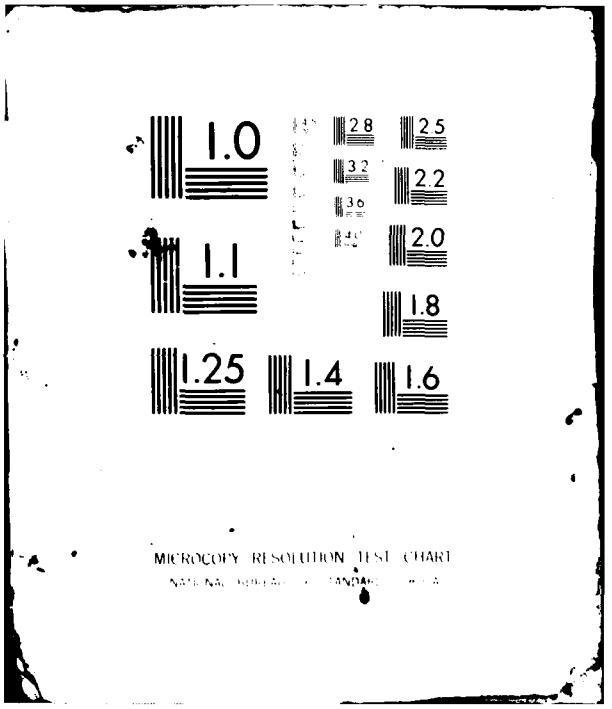
2.	2.	2.	2.	3.	3.	3.	3.	4.	4.
4.	4.	4.	5.	5.	5.	6.	6.	7.	7.
8.	8.	9.	9.	9.	11.	13.	16.	21.	27.
34.	43.	56.	70.	84.	96.	104.	106.	101.	92.
81	71	60.	51.	44.	37.	32.	28.	24.	22.
22.	23.	26.	29.	33.	37.	40.	42.	44.	46.
48.	52	59.	68.	79.	92.	105.	116.	126.	134.

AD-A109 794 FLAHERTY-GIAVARA ASSOCIATES NEW HAVEN CT F/G 13/13
NATIONAL DAM SAFETY PROGRAM. KINGSLEY BROOK RESERVOIR DAM (INVE--ETC(U)
SEP 81 H C FLAHERTY DACW51-81-C-0006
UNCLASSIFIED NL

2 - 2
AD
A109794



END
DATE FILMED
2 82
DTIC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1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
MICROCOPY RESOLUTION TEST CHART

140.	146.	157.	184.	235.	314.	421.	651.	697.	880.	
1112.	1360.	1596.	1782.	1884.	1883.	1776.	1605.	1415.	1222.	
1040.	881.	748.	637.	545.	469.	405.	350.	302.	259.	
226.	199.	181.	174.	167.	160.	154.	148.	142.	136.	
131.	126.	121.	116.	111.	107.	103.	98.	95.	91.	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1884.	1463.	576.	293.	30401.
CMS	53.	41.	16.	7.	861.
INCHES		2.61	4.12	4.52	4.52
MM		66.35	104.52	114.89	114.89
AC-FT		725.	1143.	1256.	1256.
THOUS CU M		895.	1410.	1550.	1550.

OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

0. 200. 400. 600. 800. 1000. 1200. 1400. 1600. 1800. 2000. 0. 0.

0 30 11
1 00 21
1 30 31
2 00 41
2 30 51
3 00 61
3 30 71
4 00 81
4 30 91
5 00 101
5 30 111
6 00 121
6 30 131
7 00 141
7 30 151
8 00 161
8 30 171
9 00 181
9 30 191
10 00 201
10 30 211
11 00 221
11 30 231
12 00 241
12 30 251
13 00 26. I
13 30 27. I
14 00 28. I
14 30 29. I
15 00 30. I
15 30 31. I
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16 30 33. I
17 00 34. I
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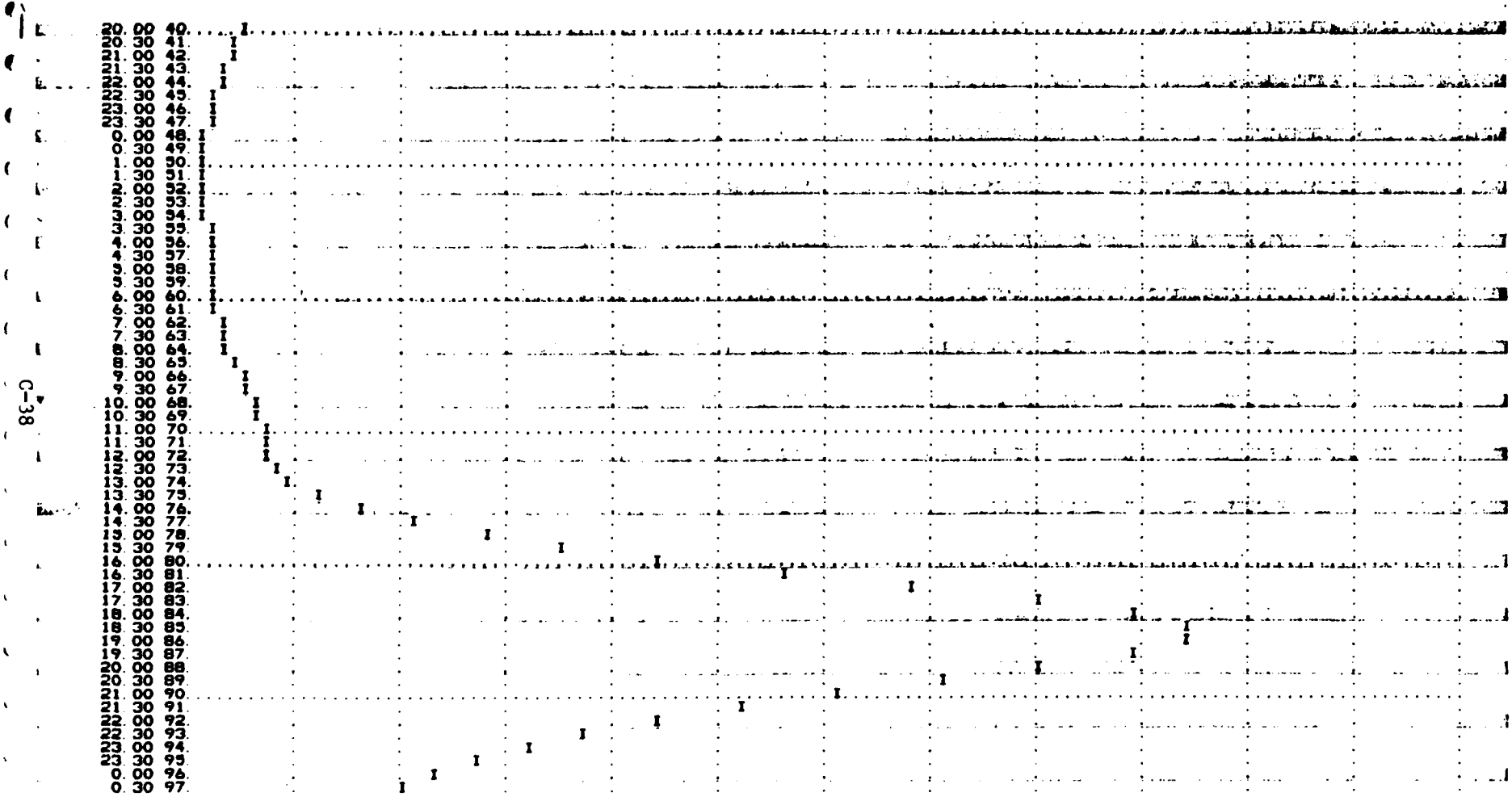
18 30 37. I
19 00 38. I
19 30 39. I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22.30 45
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23.30 47
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1.00 50
1.30 51
2.00 52
2.30 53
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4.30 57
5.00 58
5.30 59
6.00 60
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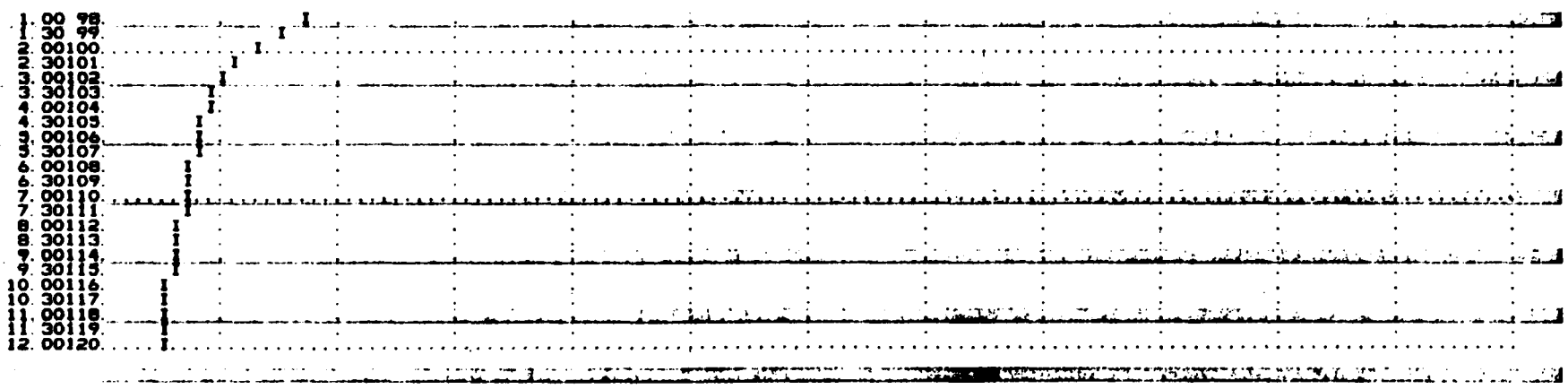

OVN

SUM OF 2 HYDROGRAPHS AT I PLAN 1 RTIO 5

2.	2.	2.	2.	3.	3.	3.	4.	4.	4.	
4.	4.	5.	5.	5.	6.	7.	7.	8.		
8.	9.	9.	9.	10.	11.	13.	17.	22.	29.	
36.	45.	58.	73.	88.	101.	109.	111.	106.	96.	
85.	74.	63.	54.	46.	39.	34.	29.	26.	24.	
23.	24.	27.	31.	35.	38.	42.	44.	46.	48.	
90.	99.	61.	71.	83.	96.	110.	122.	132.	140.	
147.	153.	165.	193.	247.	330.	442.	578.	732.	924.	
1167.	1428.	1676.	1871.	1979.	1977.	1865.	1685.	1486.	1283.	
1092.	925.	785.	669.	572.	492.	425.	367.	317.	272.	
237.	209.	190.	182.	175.	168.	162.	155.	149.	143.	
137.	132.	127.	122.	117.	112.	108.	103.	99.	95.	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1979.	1936.	605.	266.	31721.
CMS	56.	44.	17.	8.	904.
INCHES		2.74	4.32	4.75	4.75
MM		69.67	109.75	120.64	120.64
AC-FT		762.	1200.	1319.	1319.
THOUS CU M		940.	1480.	1627.	1627.

OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

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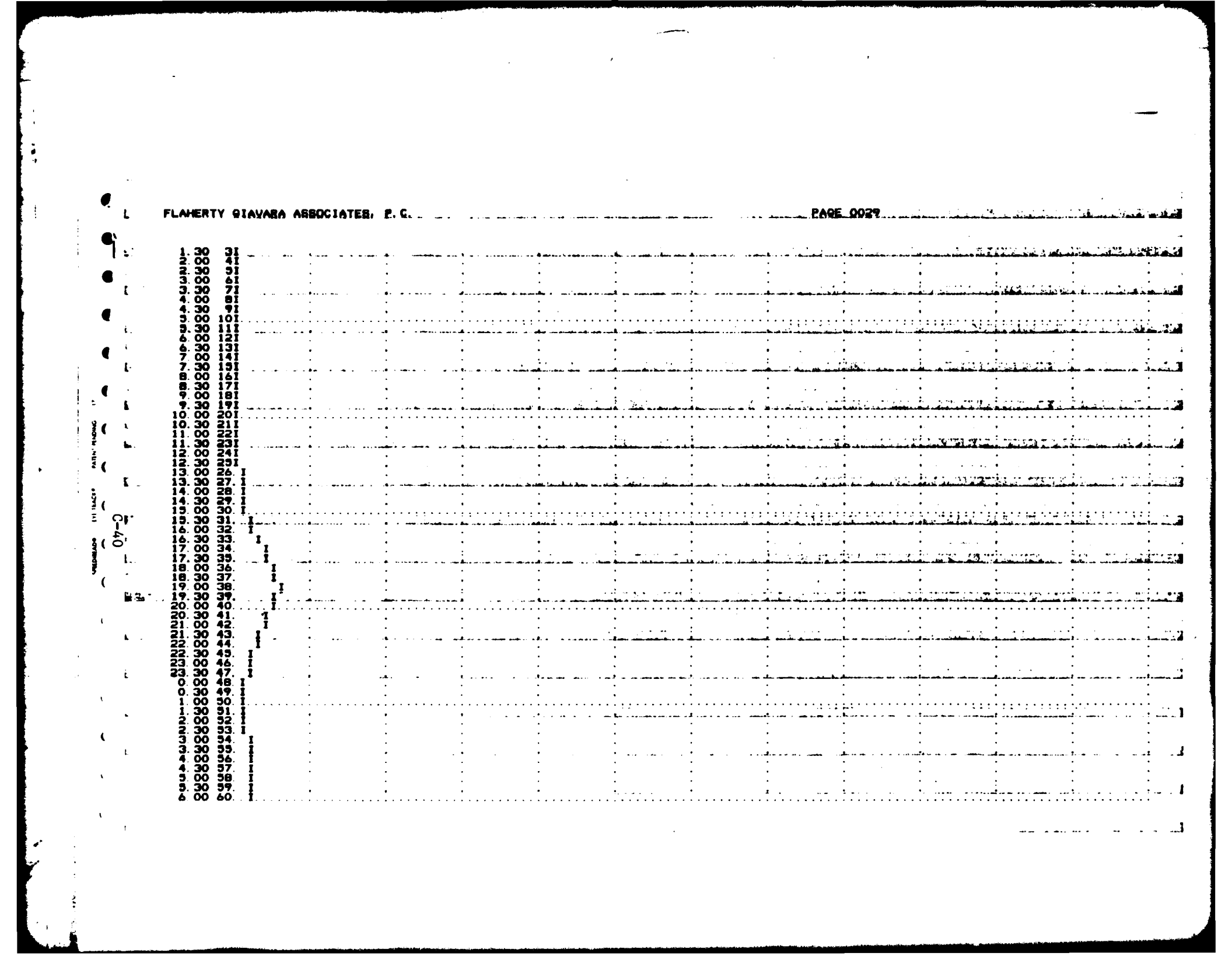
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23.30 471
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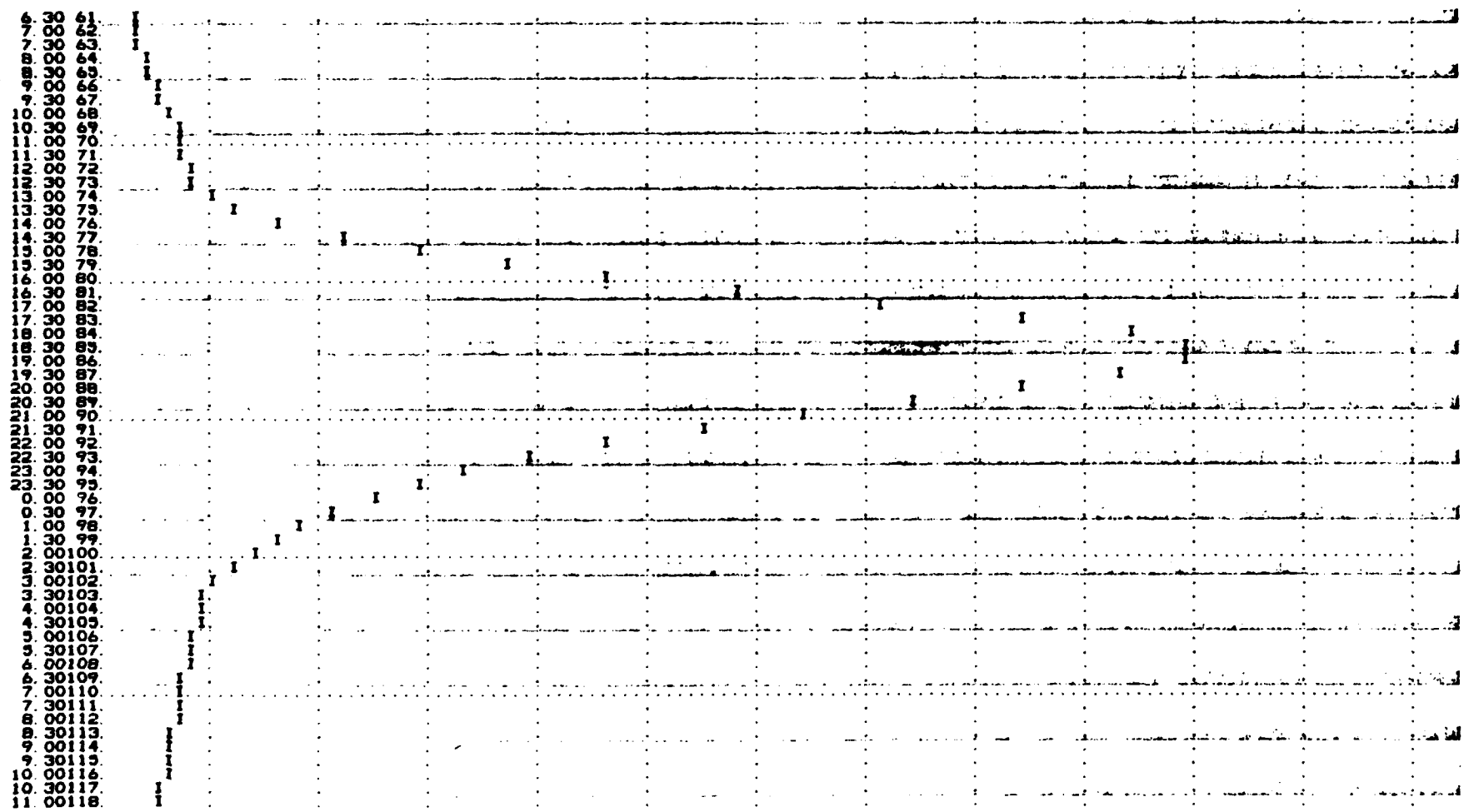
6.00 601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9:30115.
10:00116.
10:30117.
11:00118.

11 30119
12 00120

OVN

SUM OF 2 HYDROGRAPHS AT 1 PLAN 1 RTIO 6

2.	2.	2.	3.	3.	3.	4.	4.	4.	4.	
4.	5.	5.	5.	5.	6.	6.	7.	8.	8.	
9	9	9	10.	10.	12	14	18.	23	30.	
37	48	61	77	92	106	116	116	111	101	
90.	78.	66.	57.	48.	41.	35.	31.	27.	25.	
24.	26.	28.	32.	36.	40.	44.	46.	49.	51.	
53.	57.	64.	74.	87.	101.	115.	128.	138.	147.	
184.	160.	172.	202.	238.	349	463	606.	768.	1768.	
1223.	1496.	1736.	1961.	2073.	2071.	1953.	1766.	1537.	1345.	
1144.	969.	823.	701.	600.	516.	445.	389.	332.	285.	
249.	219.	199.	191.	183.	176.	169.	162.	156.	150.	
144.	138.	133.	127.	122.	117.	113.	108.	104.	100.	

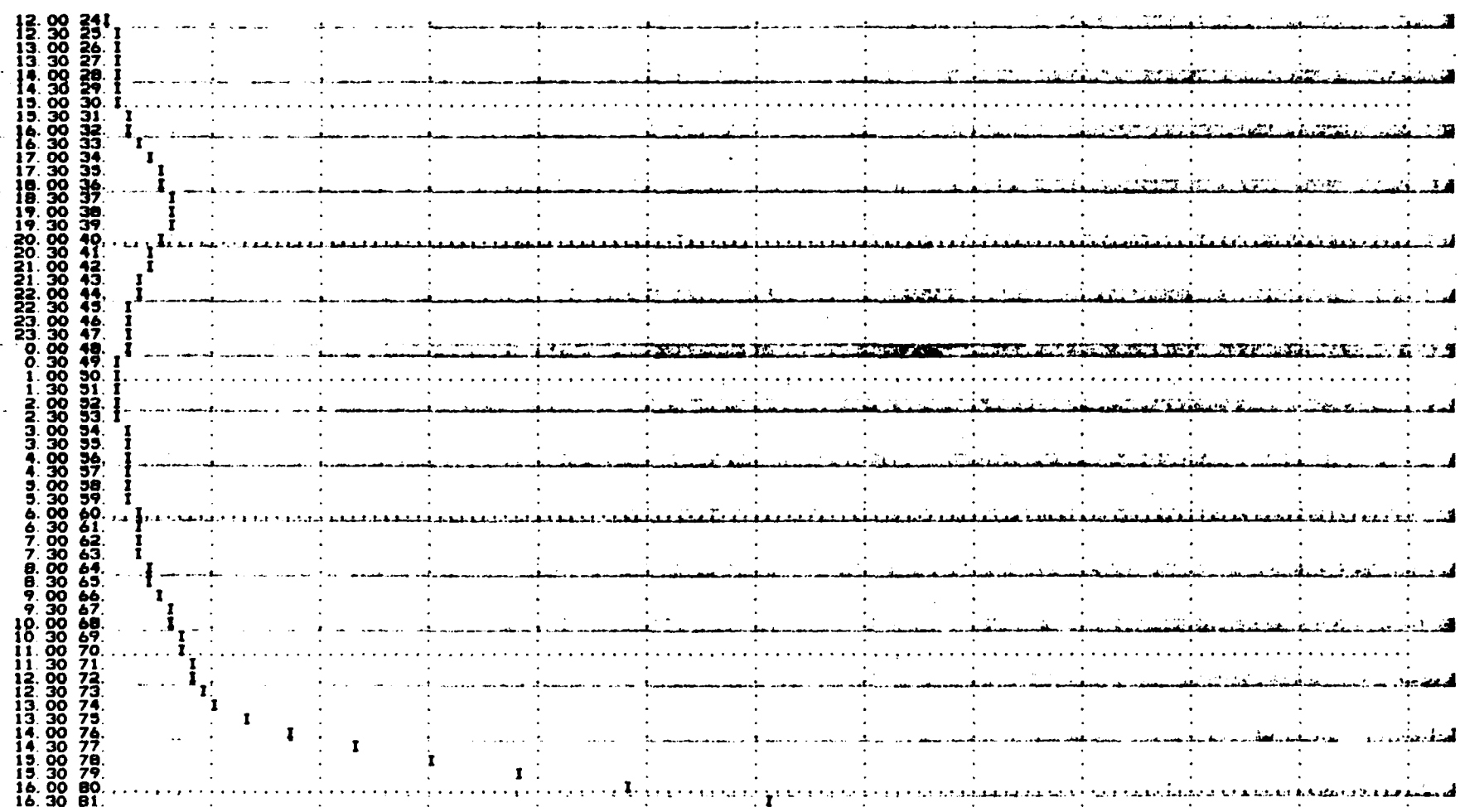
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2073.	1609.	634.	279.	33441.
CMS	59.	46.	18.	8.	947.
INCHES		2.87	4.53	4.98	4.98
MM		72.99	114.98	126.38	126.38
AC-FT		798.	1257.	1382.	1382.
THOUS CU M		984.	1551.	1704.	1704.

OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0.	200.	400.	600.	800.	1000.	1200.	1400.	1600.	1800.	2000.	2200.	0.
0 30	11												
1.00	21												
1 30	31												
2.00	41												
2 30	51												
3.00	61												
3 30	71												
4.00	81												
4 30	91												
5.00	101												
5 30	111												
6.00	121												
6 30	131												
7.00	141												
7 30	151												
8.00	161												
8 30	171												
9.00	181												
9 30	191												
10.00	201												
10 30	211												
11.00	221												
11 30	231												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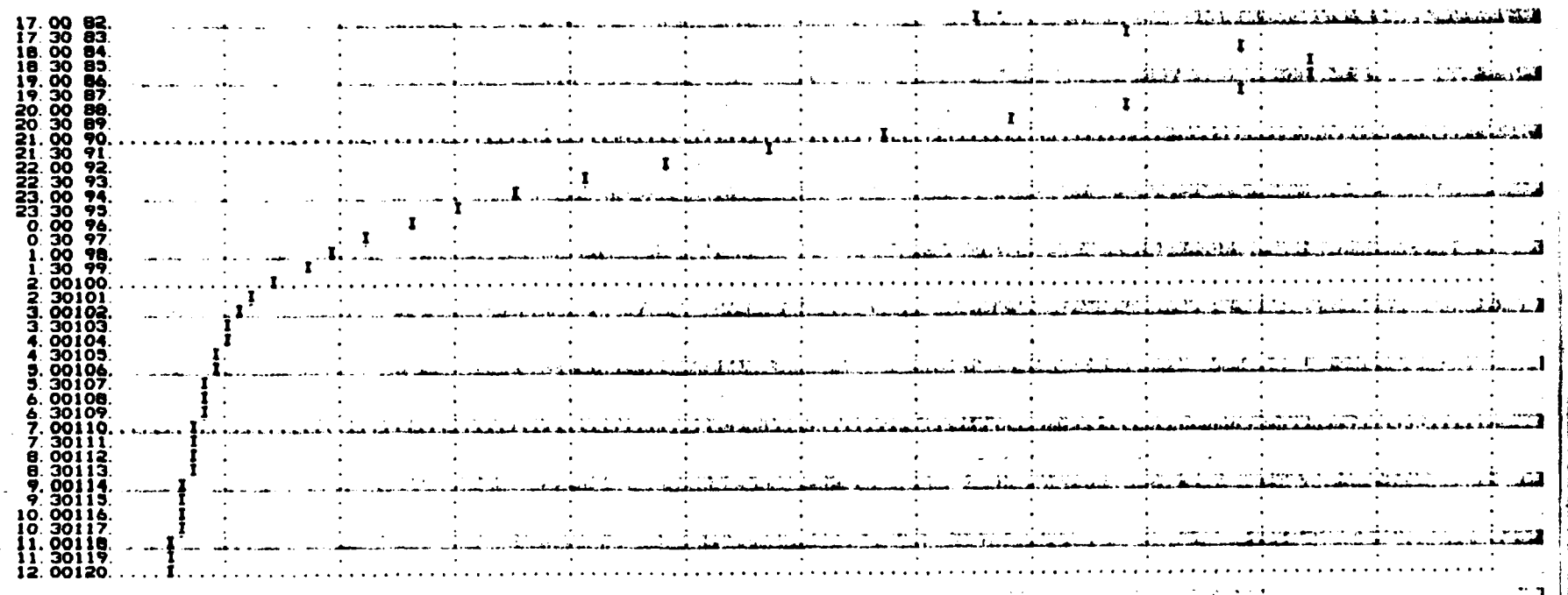

OVN

SUM OF 2 HYDROGRAPHS AT I PLAN 1 RTIO 7

2.	2.	2.	3.	3.	3.	4.	4.	4.	5.
5.	5.	5.	5.	6.	6.	7.	7.	8.	9.
9.	10.	10.	10.	11.	12.	19.	19.	24.	31.
39.	50.	64.	80.	97.	111.	119.	121.	116.	106.
94.	81.	70.	59.	50.	43.	37.	32.	28.	26.
25.	27.	30.	34.	38.	42.	46.	48.	51.	53.
55.	60.	67.	78.	91.	106.	120.	133.	144.	154.
161.	168.	180.	212.	270.	361.	484.	633.	801.	1012.
1278.	1564.	1836.	2090.	2167.	2165.	2042.	1846.	1627.	1406.
1196.	1013.	860.	733.	627.	539.	465.	402.	347.	298.
260.	229.	208.	200.	192.	184.	177.	170.	163.	157.
150.	144.	139.	133.	128.	123.	118.	113.	109.	104.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2167.	1683.	663.	291.	34961.
CMS	61.	48.	19.	8.	990.
INCHES		3.00	4.73	5.20	5.20
MM		76.30	120.20	132.13	132.13
AC-FT		834.	1314.	1445.	1445.
THOUS CU M		1029.	1621.	1782.	1782.

OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

0. 200. 400. 600. 800. 1000. 1200. 1400. 1600. 1800. 2000. 2200. 0.

0.30 11
1.00 21
1.30 31
2.00 41
2.30 51
3.00 61
3.30 71
4.00 81
4.30 91
5.00 101
5.30 111
6.00 121
6.30 131
7.00 141
7.30 151
8.00 161
8.30 171
9.00 181
9.30 191
10.00 201
10.30 211
11.00 221
11.30 231
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12.30 25. I
13.00 26. I
13.30 27. I
14.00 28. I
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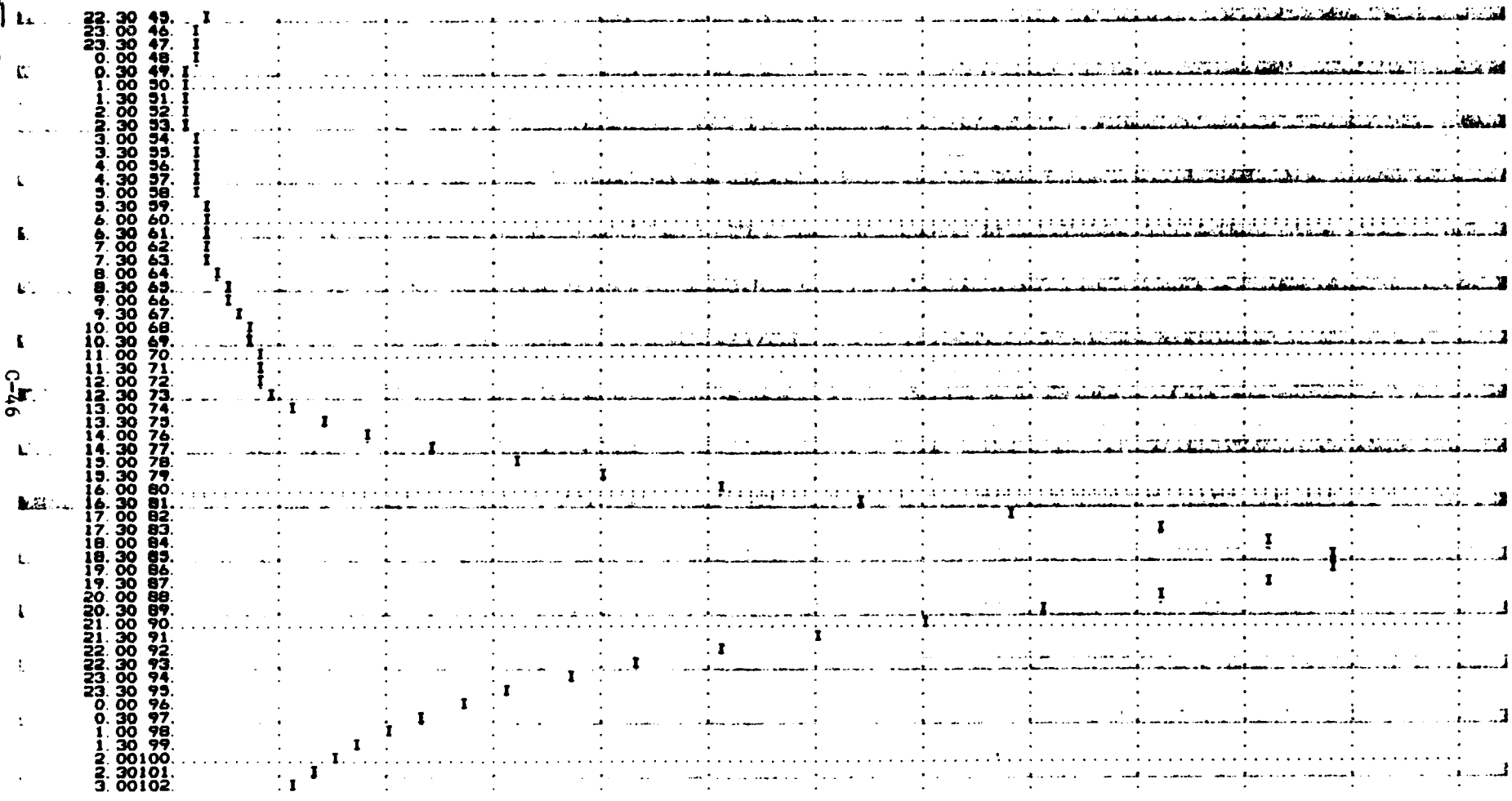
C-45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1. 00 98.
1. 30 99.
2. 00100.
2. 30101.
3. 00102.

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 8.30113  I
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10.30117  I
11.00118  I
11.30119  I
12.00120  I
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DVN

SUM OF 2 HYDROGRAPHS AT 1 PLAN 1 RATIO

5.	5.	5.	6.	6.	7.	8.	9.	9.	10.	
10.	10.	11.	11.	12.	13.	14.	16.	17.	19.	
20.	21.	21.	22.	23.	26.	32.	41.	53.	68.	
85.	108.	139.	174.	210.	240.	259.	264.	252.	230.	
204.	177.	151.	128.	109.	94.	80.	69.	61.	56.	
55.	58.	64.	73.	83.	92.	99.	105.	110.	113.	
120.	130.	146.	169.	198.	229.	261.	290.	314.	334.	
350.	364.	392.	460.	587.	789.	1092.	1377.	1742.	2201.	
2779.	3400.	3990.	4456.	4711.	4707.	4440.	4013.	3538.	3056.	
2601.	2202.	1869.	1593.	1363.	1172.	1012.	879.	754.	647.	
565.	498.	452.	434.	417.	400.	385.	369.	355.	340.	
327.	314.	301.	290.	278.	267.	256.	246.	236.	227.	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4711.	3658.	1440.	633.	76002.
CMS	133.	104.	41.	18.	2152.
INCHES		6.53	10.29	11.31	11.31
MM		165.88	261.31	287.23	287.23
AC-FT		1814.	2857.	3141.	3141.
THOUS CU M		2237.	3524.	3874.	3874.

DVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

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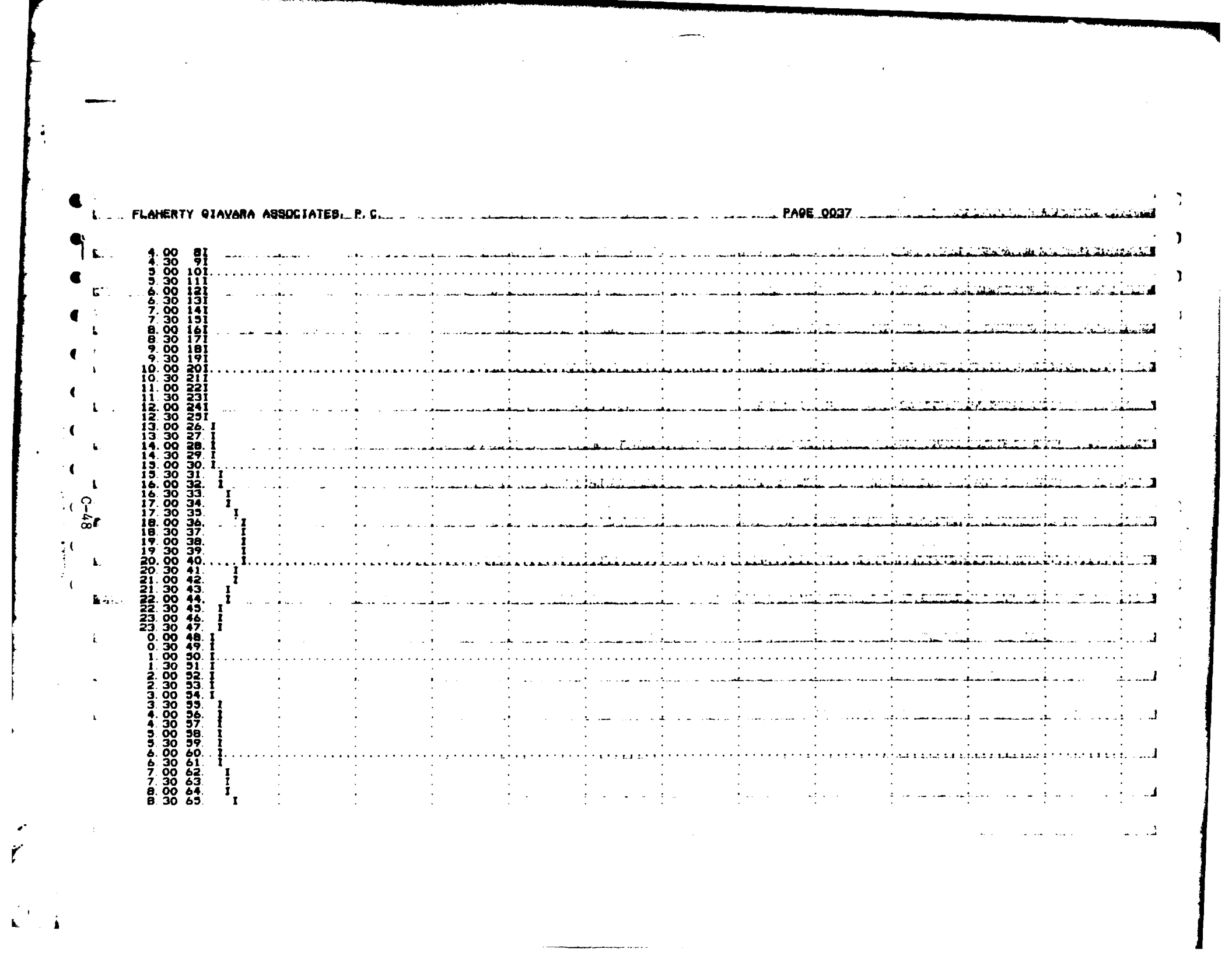
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10.30 211
11.00 221
11.30 231
12.00 241
12.30 251
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13.30 27.
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15.30 31.
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21.30 43.
22.00 44.
22.30 45.
23.00 46.
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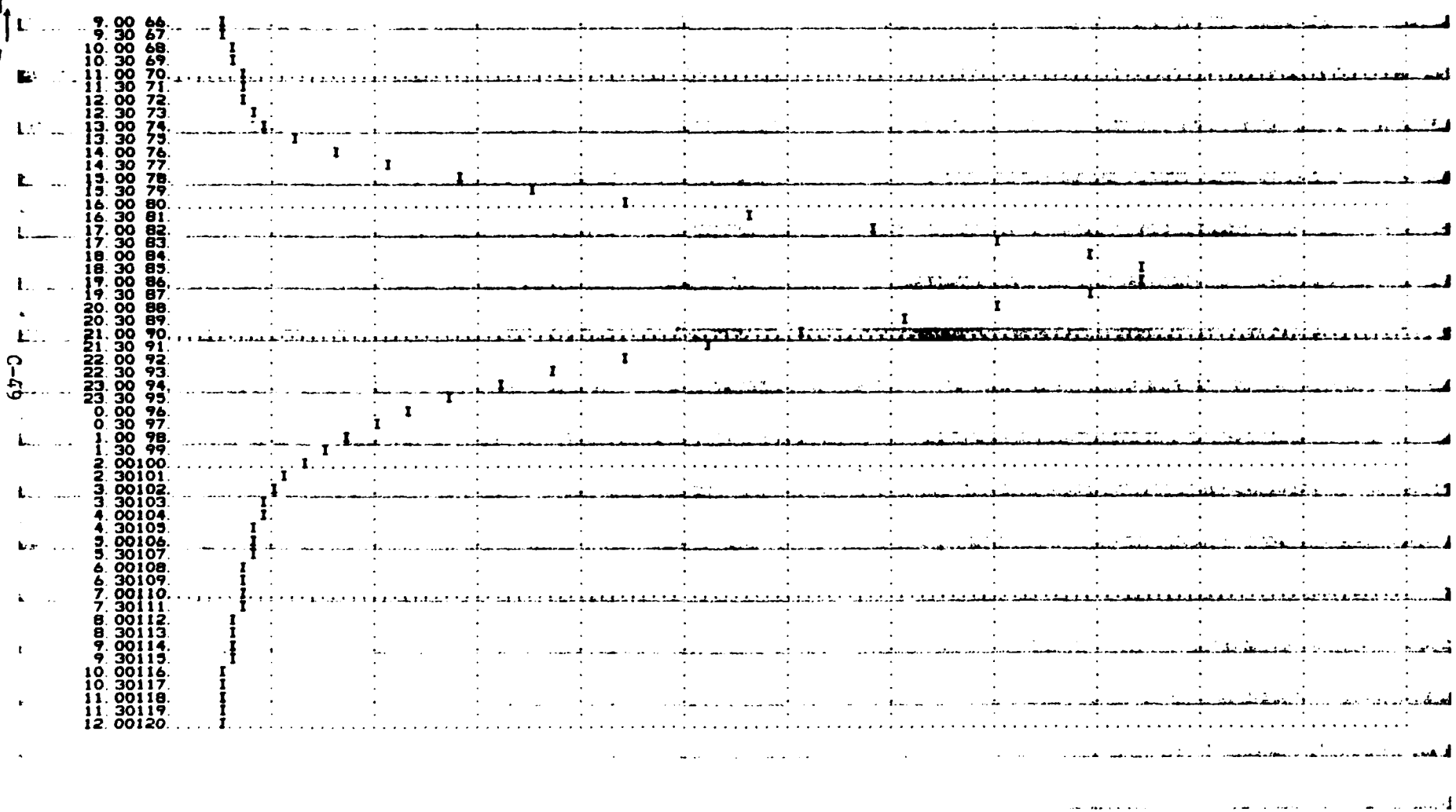
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8.00112
8.30113
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9.30115
10.00116
10.30117
11.00118
11.30119
12.00120

OVN

SUM OF 2 HYDROGRAPHS AT 1 PLAN 1 RTIO 9

10.	10.	11.	11.	13.	14.	16.	17.	19.	20.	
20.	21.	22.	23.	24.	26.	29.	32.	35.	37.	
40.	41.	43.	44.	47.	53.	64.	82.	106.	136.	
170.	216.	278.	349.	420.	481.	519.	528.	504.	459.	
407.	354.	302.	257.	219.	187.	161.	139.	122.	110.	
110.	116.	129.	146.	165.	183.	198.	211.	221.	230.	
240.	260.	293.	338.	396.	459.	523.	580.	628.	668.	
701.	729.	784.	920.	1175.	1570.	2104.	2754.	3484.	4401.	
5559.	6801.	7981.	8912.	9422.	9414.	8879.	8026.	7073.	6118.	
5202.	4405.	3739.	3186.	2726.	2344.	2024.	1749.	1509.	1294.	
1131.	996.	904.	869.	834.	801.	769.	738.	709.	681.	
654.	628.	603.	579.	556.	534.	513.	492.	473.	454.	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	9422.	7315.	2881.	1267.	192004.
CMS	267.	207.	82.	36.	4304.
INCHES		13.06	20.88	22.62	22.62
MM		331.76	522.62	574.46	574.46
AC-FT		3627.	5714.	6281.	6281.
THOUS CU M		4474.	7049.	7748.	7748.

OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

		0.	1000.	2000.	3000.	4000.	5000.	6000.	7000.	8000.	9000.	10000.	0.	0.
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1.00	21													
1.30	31													
2.00	41													
2.30	51													
3.00	61													
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8.30	171													
9.00	181													
9.30	191													
10.00	201													
10.30	211													
11.00	221													
11.30	231													
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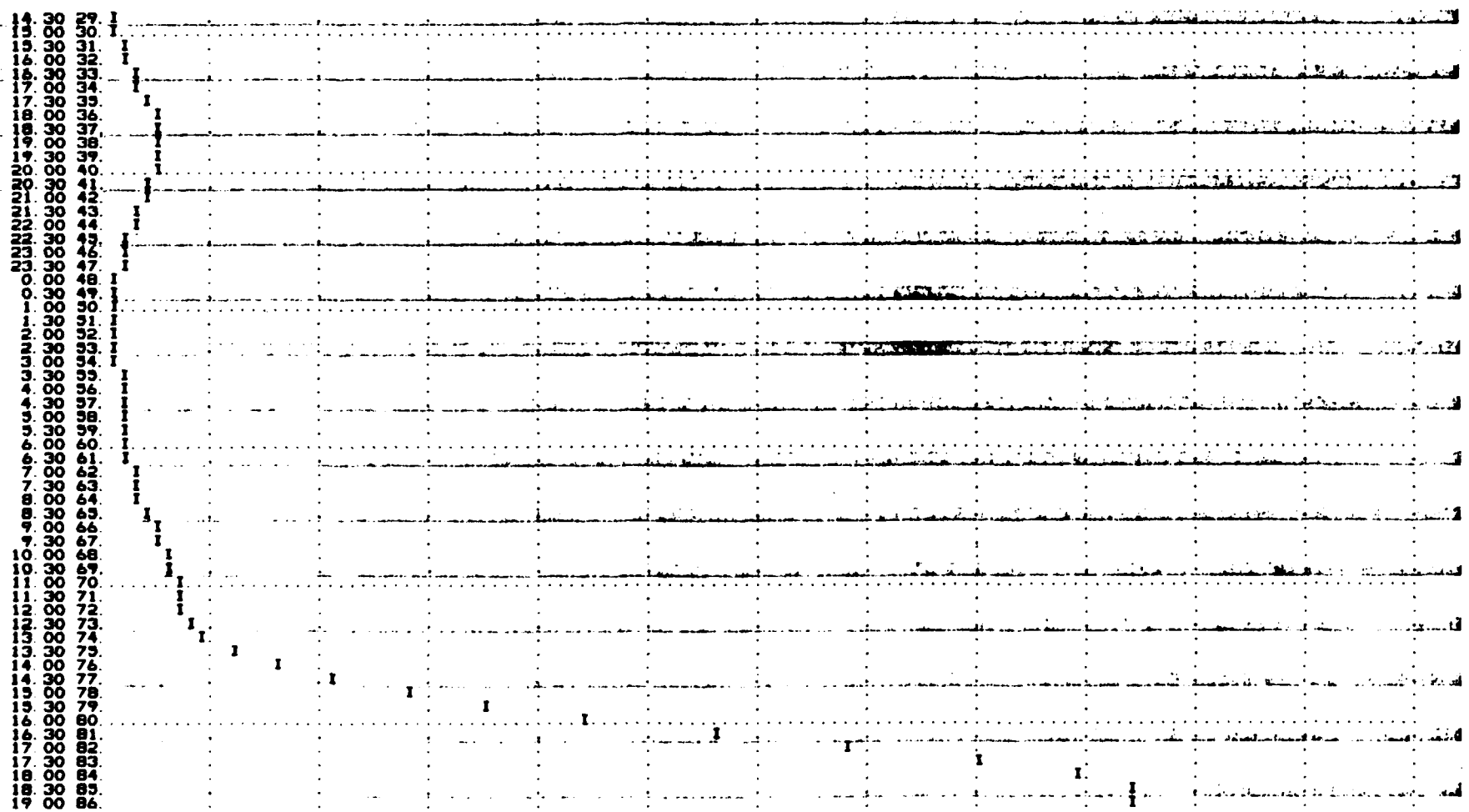
13.30	27. I													
14.00	28. I													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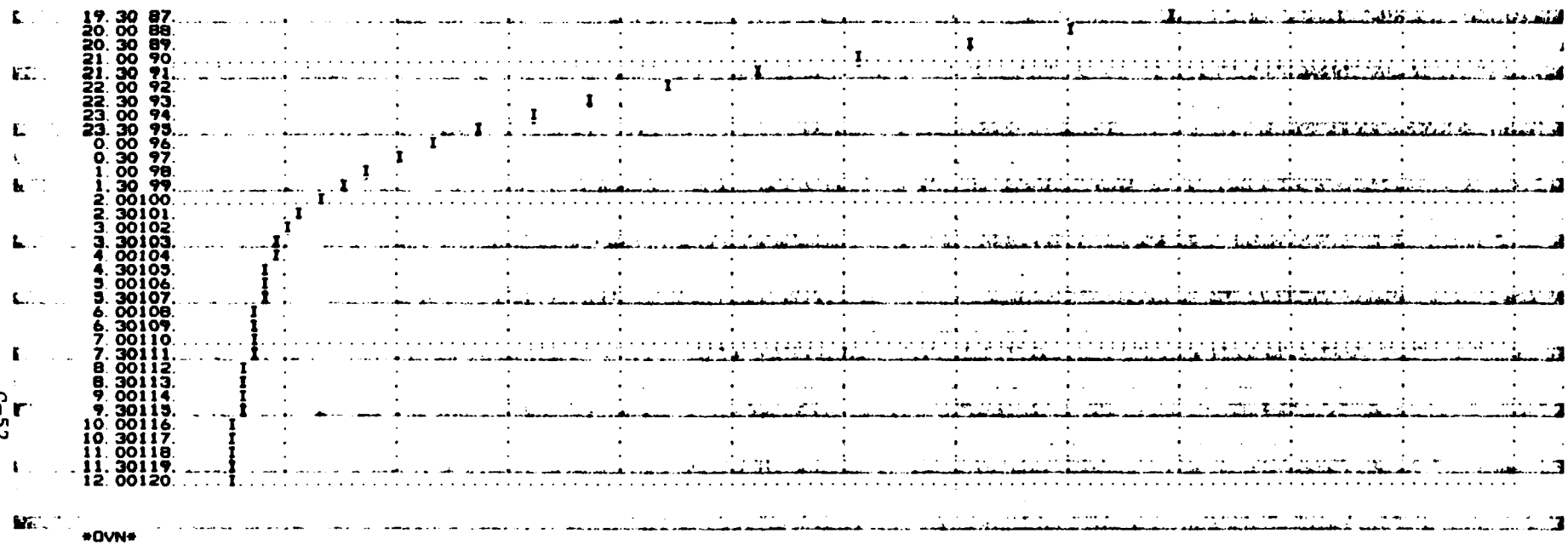

OVN

********** *********** ********** ********* **********

HYDROGRAPH ROUTING

RESERVOIR ROUTING - MODIFIED PULS METHOD

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	1	0	0	0	0	1	0	0

ROUTING DATA

GLOSS	CLOSS	AVQ	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	0.	-1

STAGE	1311.00	1312.00	1313.00	1314.00	1315.00	1315.50	1316.00	1317.00	1318.00	1319.00
	1320.00									

FLOW	0.00 12350.00	48.00	135.80	249.40	384.00	498.20	574.90	671.30	2248.10	7032.60
SURFACE AREA=	119.	138.	193.							
CAPACITY=	0.	1156.	4446.							
ELEVATION=	1311.	1320.	1340.							

CREL	SPWID	COGW	EXPW	ELEVL	COGL	CAREA	EXPL
1311.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COGD	EXPD	DAMWID
1317.0	2.5	1.5	877.

STATION 1, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
2.	2.	2.	3.	3.	4.	5.	5.	6.	7.
7.	8.	8.	9.	9.	9.	9.	9.	9.	9.
9.	9.	9.	10.	10.	10.	10.	10.	10.	10.
11.	11.	11.	12.	12.	12.	13.	14.	14.	15.
16.	17.	18.	19.	20.	22.	25.	29.	33.	39.
46.	62.	82.	104.	128.	156.	184.	208.	229.	244.
258.	267.	273.	276.	277.	276.	274.	270.	265.	260.
254.	248.	242.	236.	231.	225.	220.	215.	209.	204.
199.	194.	189.	184.	179.	175.	170.	166.	161.	157.

STORAGE

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1.	1.	2.	2.	2.	2.	2.	2.	3.	3.
4.	4.	5.	7.	8.	10.	12.	14.	15.	17.
19.	20.	21.	22.	22.	23.	23.	23.	23.	23.
24.	24.	24.	24.	24.	24.	25.	25.	26.	26.
27.	27.	28.	29.	30.	31.	32.	34.	36.	38.
40.	43.	45.	48.	51.	56.	62.	71.	83.	98.
117.	140.	167.	198.	232.	265.	295.	322.	344.	362.
375.	384.	389.	392.	393.	392.	390.	386.	382.	377.
371.	365.	359.	353.	347.	341.	335.	329.	323.	317.
312.	306.	301.	296.	290.	285.	280.	275.	271.	266.

STAGE

1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0
1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0
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1311.0	1311.0	1311.0	1311.1	1311.1	1311.1	1311.1	1311.1	1311.1	1311.1
1311.2	1311.2	1311.2	1311.2	1311.2	1311.2	1311.2	1311.2	1311.2	1311.2
1311.2	1311.2	1311.2	1311.2	1311.2	1311.2	1311.2	1311.2	1311.2	1311.2
1311.2	1311.2	1311.2	1311.2	1311.2	1311.3	1311.3	1311.3	1311.3	1311.3
1311.3	1311.4	1311.4	1311.4	1311.4	1311.5	1311.5	1311.6	1311.7	1311.8
1312.0	1312.2	1312.4	1312.6	1312.9	1313.2	1313.4	1313.6	1313.8	1314.0

1314.1	1314.1	1314.2	1314.2	1314.2	1314.2	1314.2	1314.2	1314.1	1314.1
1314.0	1314.0	1313.9	1313.9	1313.8	1313.8	1313.7	1313.7	1313.6	1313.6
1313.6	1313.5	1313.5	1313.4	1313.4	1313.3	1313.3	1313.3	1313.2	1313.2

PEAK OUTFLOW IS 277. AT TIME 47.50 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	277.	266.	174.	73.	8721.
CMS	8.	8.	5.	2.	247.
INCHES		0.48	1.24	1.30	1.30
MM		12.08	31.50	32.96	32.96
AC-FT		132.	344.	360.	360.
THOUS CU M		163.	425.	443.	443.

OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

0. 200. 400. 600. 800. 1000. 0. 0. 0. 0. 0. 0. 0.

0.30	11	I
1.00	21	I
1.30	31	I
2.00	41	I
2.30	51	I
3.00	61	I
3.30	71	I
4.00	81	I
4.30	91	I
5.00	101	I
5.30	111	I
6.00	121	I
6.30	131	I
7.00	141	I
7.30	151	I
8.00	161	I
8.30	171	I
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16.00	3201	I
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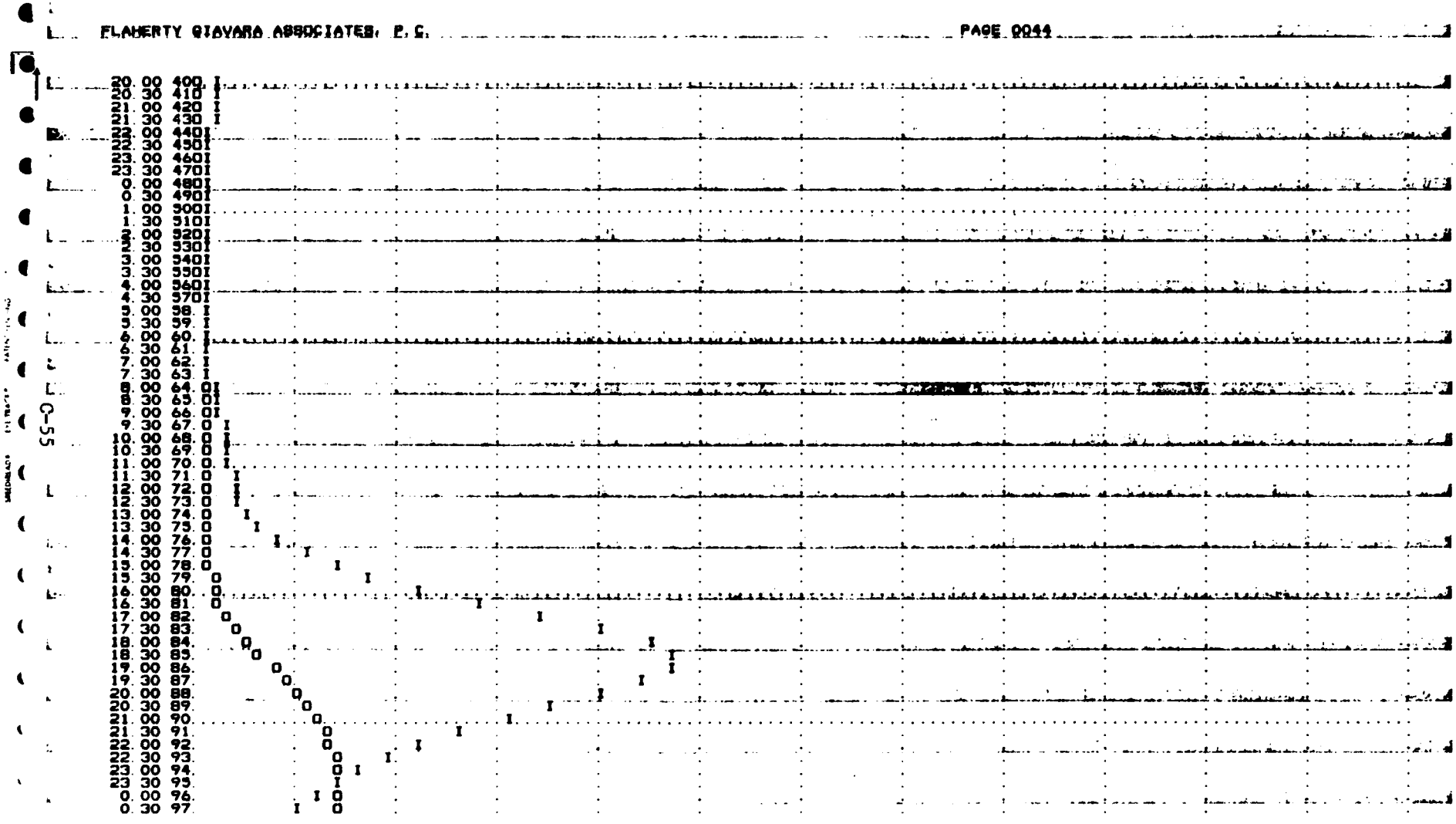
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1.30 510
2.00 520
2.30 530
3.00 540
3.30 550
4.00 560
4.30 570
5.00 58.
5.30 59.
6.00 60.
6.30 61.
7.00 62.
7.30 63.
8.00 64.
8.30 65.
9.00 66.
9.30 67.
10.00 68.
10.30 69.
11.00 70.
11.30 71.
12.00 72.
12.30 73.
13.00 74.
13.30 75.
14.00 76.
14.30 77.
15.00 78.
15.30 79.
16.00 80.
16.30 81.
17.00 82.
17.30 83.
18.00 84.
18.30 85.
19.00 86.
19.30 87.
20.00 88.
20.30 89.
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22.00 92.
22.30 93.
23.00 94.
23.30 95.
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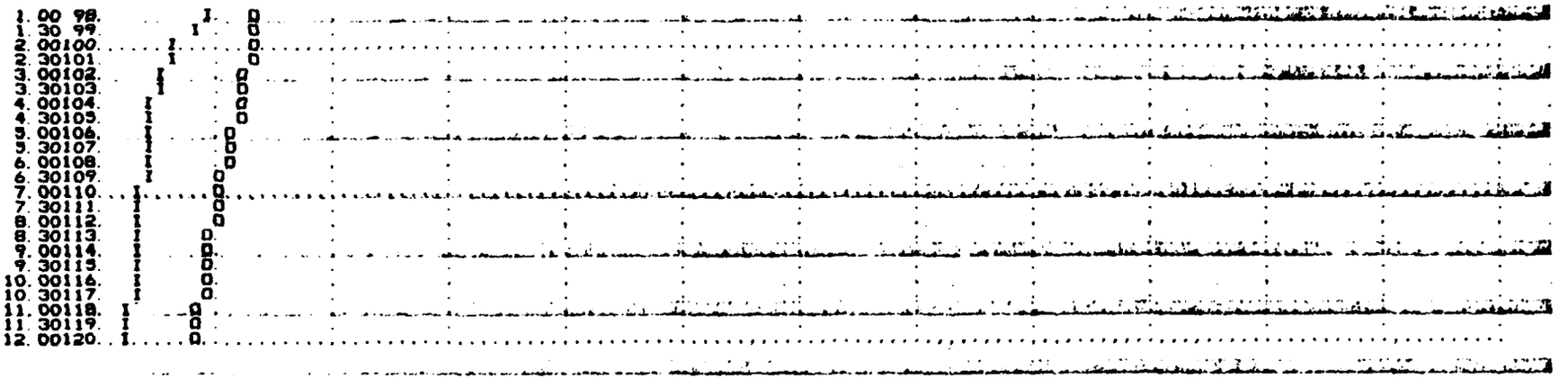
0.30 97.



OVN

STATION 1, PLAN 1, RATIO 2

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	2.	2.	2.	2.	2.
3.	3.	4.	5.	6.	7.	9.	10.	11.	13.
14.	14.	15.	16.	16.	17.	17.	17.	17.	17.
17.	17.	17.	17.	18.	18.	18.	18.	19.	19.
19.	20.	20.	21.	22.	23.	24.	25.	26.	28.
29.	31.	33.	34.	37.	40.	45.	54.	69.	88.
111.	142.	186.	235.	294.	354.	412.	467.	532.	577.
590.	598.	602.	603.	601.	596.	590.	583.	572.	549.
525.	501.	477.	456.	442.	428.	414.	401.	388.	377.
366.	359.	349.	334.	324.	315.	309.	296.	287.	278.

STORAGE

0.	0.	0.	0.	0.	0.	0.	1.	1.	1.
1.	1.	1.	1.	1.	2.	2.	2.	2.	3.
3.	3.	3.	3.	4.	4.	4.	5.	5.	6.
7.	8.	10.	12.	15.	18.	21.	25.	28.	31.
34.	36.	38.	39.	40.	41.	42.	42.	43.	43.
43.	43.	43.	43.	44.	44.	45.	46.	47.	47.
48.	49.	51.	52.	54.	56.	59.	62.	65.	69.
73.	77.	81.	86.	93.	101.	113.	129.	150.	176.
209.	249.	298.	352.	409.	465.	518.	562.	598.	624.
642.	653.	659.	659.	656.	651.	642.	632.	620.	608.
594.	581.	568.	555.	543.	531.	520.	508.	497.	487.

476.	466.	456.	447.	437.	428.	419.	410.	402.	394.
STAGE									
1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0
1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0
1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.1
1311.1	1311.1	1311.1	1311.1	1311.1	1311.1	1311.2	1311.2	1311.2	1311.3
1311.3	1311.3	1311.3	1311.3	1311.3	1311.3	1311.3	1311.4	1311.4	1311.4
1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4
1311.4	1311.4	1311.4	1311.4	1311.5	1311.5	1311.5	1311.5	1311.5	1311.6
1311.6	1311.6	1311.7	1311.7	1311.8	1311.8	1311.9	1312.1	1312.2	1312.5
1312.7	1313.1	1313.4	1313.9	1314.3	1314.8	1315.2	1315.5	1315.8	1316.0
1316.2	1316.2	1316.3	1316.3	1316.3	1316.2	1316.2	1316.1	1316.0	1315.9
1315.8	1315.7	1315.6	1315.5	1315.4	1315.3	1315.2	1315.1	1315.0	1314.9
1314.9	1314.8	1314.7	1314.6	1314.6	1314.5	1314.4	1314.3	1314.3	1314.2

PEAK OUTFLOW IS 603. AT TIME 47.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	603.	382.	356.	148.	17789.
CMS	17.	16.	10.	4.	504.
INCHES		1.04	2.54	2.65	2.65
MM		26.41	64.57	67.23	67.23
AC-FT		289.	706.	735.	735.
THOUS CU M		356.	871.	907.	907.

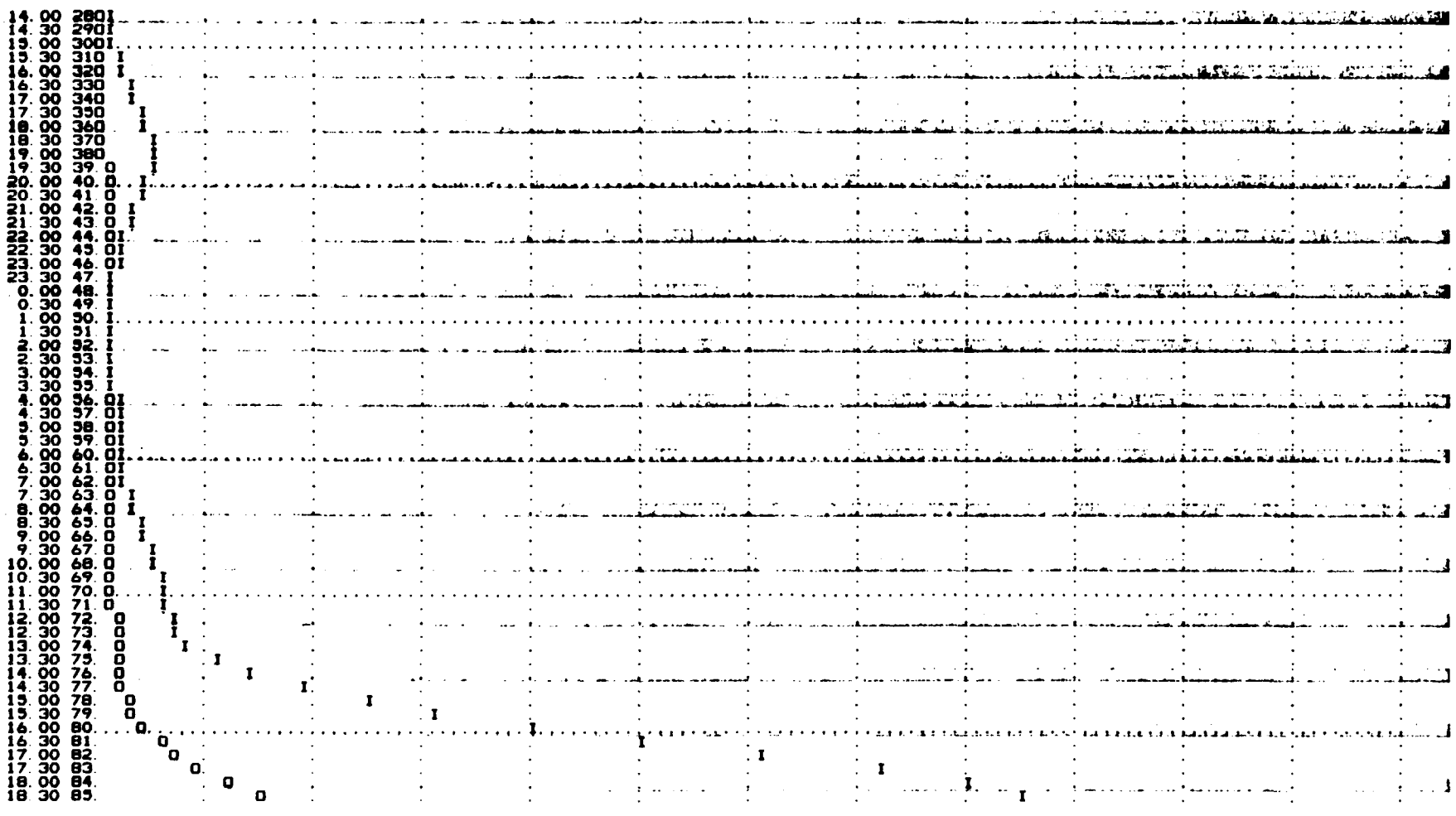
#OVF#

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

0. 200. 400. 600. 800. 1000. 1200. 1400. 1600. 1800. 0. 0. 0.

0	30	11
1	00	21
1	30	31
2	00	41
2	30	51
3	00	61
3	30	71
4	00	81
4	30	91
5	00	101
5	30	111
6	00	121
6	30	131
7	00	141
7	30	151
8	00	161
8	30	171
9	00	181
9	30	191
10	00	201
10	30	211
11	00	221
11	30	231
12	00	241
12	30	251
13	00	261
13	30	2701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15.00 300
15.30 310
16.00 320
16.30 330
17.00 340
17.30 350
18.00 360
18.30 370
19.00 380
19.30 390
20.00 400
20.30 410
21.00 420
21.30 430
22.00 440
22.30 450
23.00 460
23.30 470
0.00 480
0.30 490
1.00 500
1.30 510
2.00 520
2.30 530
3.00 540
3.30 550
4.00 560
4.30 570
5.00 580
5.30 590
6.00 600
6.30 610
7.00 620
7.30 630
8.00 640
8.30 650
9.00 660
9.30 670
10.00 680
10.30 690
11.00 700
11.30 710
12.00 720
12.30 730
13.00 740
13.30 750
14.00 760
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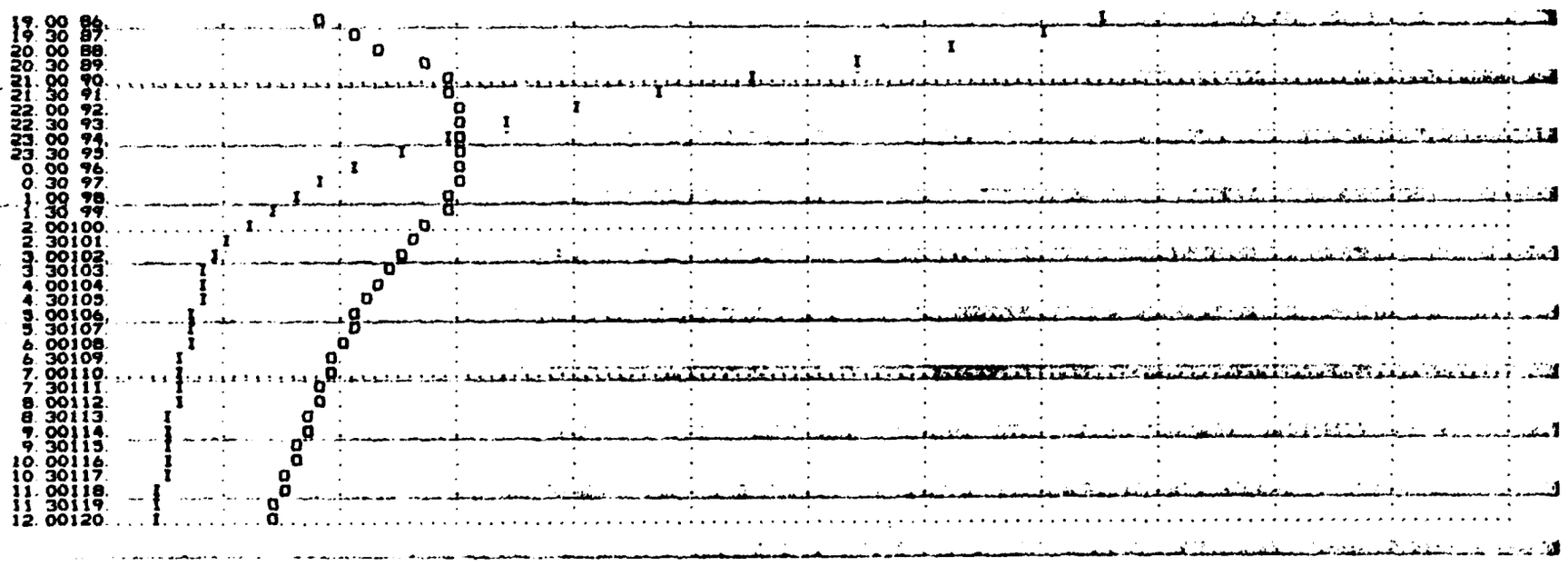
17.00 820
17.30 830
18.00 840
18.30 850



DVN

STATION 1, PLAN 1, RATIO 3

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0	0	0	0	0	0	0	0	0	0
0	0	0	1	1	1	1	1	1	1
1	1	1	1	2	2	2	2	2	3
3	4	4	5	6	8	9	11	12	13
14	15	16	17	17	17	18	18	18	18
18	18	18	18	19	19	19	19	20	20
20	21	21	22	23	24	25	26	28	29
31	33	34	36	39	43	48	59	75	95
120	154	201	253	317	380	444	520	579	600
614	623	628	628	627	622	616	608	599	589
578	556	529	503	478	456	441	428	414	401
388	376	365	354	344	333	323	313	304	294

STORAGE

0.	0.	0.	0.	0.	0.	0.	1.	1.	1.
1.	1.	1.	1.	2.	2.	2.	2.	2.	2.
3.	3.	3.	3.	4.	4.	4.	5.	6.	6.
8.	9.	11.	13.	16.	19.	22.	26.	30.	33.
36.	38.	40.	42.	43.	44.	44.	45.	45.	45.
45.	45.	45.	46.	46.	47.	47.	48.	49.	50.
51.	52.	53.	55.	57.	59.	62.	65.	69.	73.
77.	81.	86.	91.	98.	107.	119.	136.	158.	189.
220.	263.	314.	370.	431.	490.	545.	591.	628.	655.
675.	687.	693.	694.	691.	685.	677.	667.	654.	641.
626.	611.	596.	582.	568.	555.	543.	531.	519.	508.
497.	486.	476.	465.	455.	446.	436.	427.	418.	407.

STAGE

1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0
1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0
1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.1
1311.1	1311.1	1311.1	1311.1	1311.1	1311.2	1311.2	1311.2	1311.2	1311.3
1311.3	1311.3	1311.3	1311.3	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4
1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4
1311.4	1311.4	1311.4	1311.5	1311.5	1311.5	1311.5	1311.5	1311.6	1311.6
1311.6	1311.7	1311.7	1311.8	1311.8	1311.9	1312.0	1312.1	1312.3	1312.5
1312.8	1313.2	1313.6	1314.0	1314.5	1315.0	1315.4	1315.8	1316.0	1316.3
1316.4	1316.5	1316.5	1316.6	1316.6	1316.6	1316.6	1316.4	1316.3	1316.1
1316.0	1315.9	1315.8	1315.7	1315.6	1315.5	1315.4	1315.3	1315.2	1315.1
1315.0	1314.9	1314.9	1314.8	1314.7	1314.6	1314.5	1314.5	1314.4	1314.3

PEAK OUTFLOW IS 628. AT TIME 47.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	628.	611.	379.	158.	18939.
CMS	18.	17.	11.	4.	536.
INCHES		1.09	2.71	2.82	2.82
MM		27.71	68.77	71.58	71.58
AC-FT		303.	752.	783.	783.
THOUS CU M		374.	927.	965.	965.

OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0.	200.	400.	600.	800.	1000.	1200.	1400.	1600.	1800.	0.	0.	0.
0 30	11												
1.00	21												
1 30	31												
2.00	41												
2 30	51												
3.00	61												
3 30	71												
4.00	81												
4 30	91												
5.00	101												
5 30	111												
6.00	121												
6 30	131												
7.00	141												
7 30	151												

```
 8:00  16I
 8:30  17I
 9:00  18I
 9:30  19I
10:00  20I
10:30  21I
11:00  22I
11:30  23I
12:00  24I
12:30  25I
13:00  26OI
13:30  27OI
14:00  28OI
14:30  29OI
15:00  30OI
15:30  31O I
16:00  32O  I
16:30  33O   I
17:00  34O   I
17:30  35O    I
18:00  36O     I
18:30  37O     I
19:00  38.O    I
19:30  39.O    I
20:00  40.O.   I
20:30  41.O    I
21:00  42.O I
21:30  43.O I
22:00  44.OI
22:30  45.OI
23:00  46.OI
23:30  47.OI
 0:00  48.I
 0:30  49.I
 1:00  50.I
 1:30  51.I
 2:00  52.I
 2:30  53.I
 3:00  54.I
 3:30  55.OI
 4:00  56.OI
 4:30  57.OI
 5:00  58.OI
 5:30  59.OI
 6:00  60.OI
 6:30  61.OI
 7:00  62.OI
 7:30  63.O I
 8:00  64.O  I
 8:30  65.O   I
 9:00  66.O   I
 9:30  67.O    I
10:00  68.O     I
10:30  69.O     I
11:00  70.O     I
11:30  71  O      I
12:00  72. O      I
12:30  73  O      I
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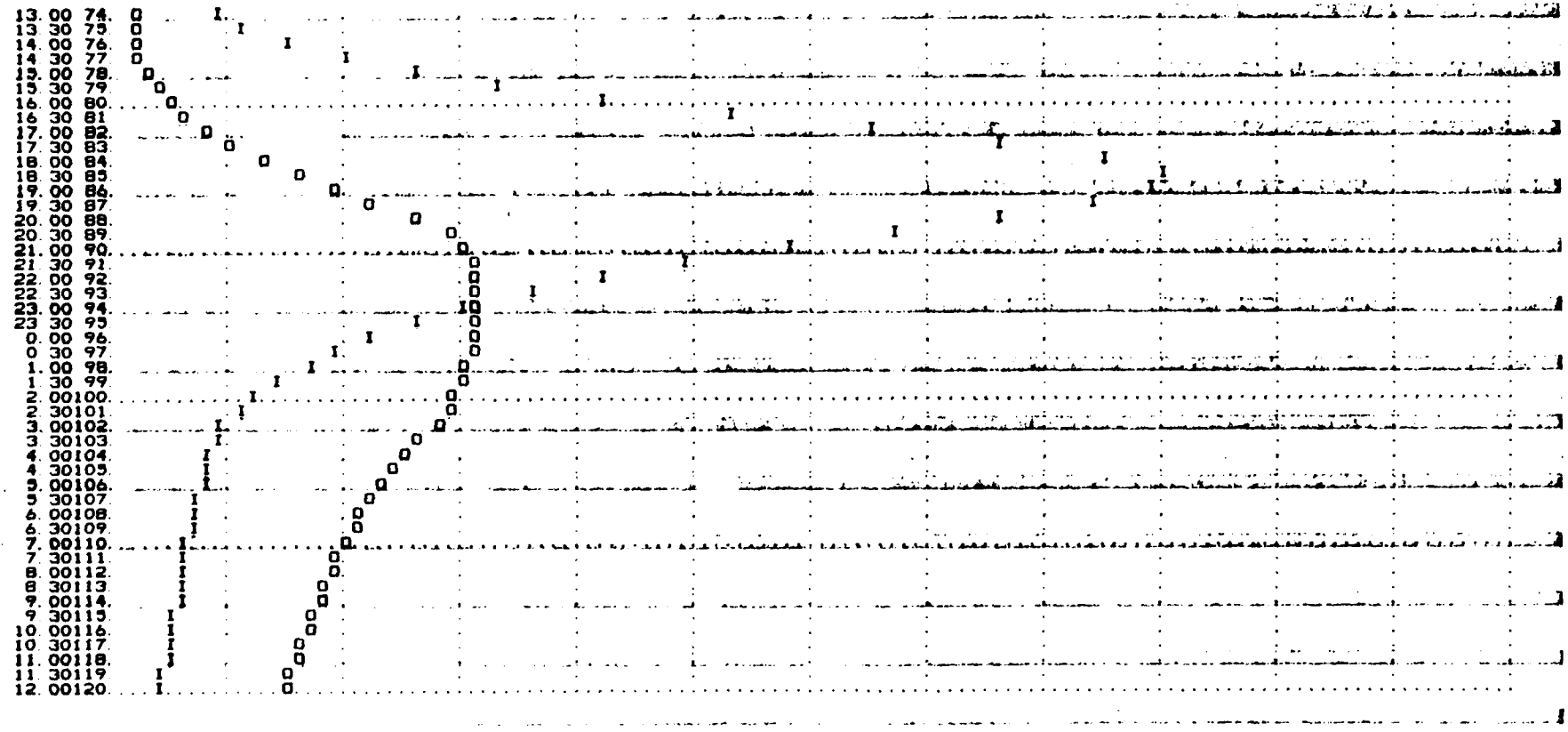

DVN

STATION 1, PLAN 1, RATIO 4

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0 0. 0. 0. 0. 0. 0. 0. 0. 0.

0.	0.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	2.	2.	2.	2.	2.	2.	3.
3.	4.	5.	5.	7.	8.	9.	11.	13.	14.
15.	16.	17.	18.	18.	18.	19.	19.	19.	19.
19.	19.	19.	19.	20.	20.	20.	20.	21.	21.
22.	22.	23.	23.	24.	25.	26.	28.	29.	31.
32.	34.	36.	38.	41.	45.	52.	65.	81.	102.
128.	167.	215.	273.	340.	409.	484.	571.	602.	623.
639.	648.	653.	654.	652.	648.	642.	634.	625.	614.
603.	591.	579.	566.	528.	502.	477.	455.	440.	426.
413.	399.	386.	375.	363.	352.	342.	331.	321.	311.

STORAGE

0.	0.	0.	0.	0.	0.	1.	1.	1.	1.
1.	1.	1.	1.	2.	2.	2.	2.	2.	3.
3.	3.	3.	4.	4.	4.	5.	5.	6.	7.
8.	9.	11.	14.	16.	20.	24.	28.	31.	35.
38.	40.	42.	44.	45.	46.	47.	47.	47.	47.
48.	48.	48.	48.	49.	49.	50.	51.	52.	53.
54.	55.	56.	58.	60.	63.	66.	69.	73.	77.
81.	86.	90.	96.	103.	113.	126.	143.	166.	195.
231.	276.	329.	389.	452.	515.	572.	620.	658.	687.
708.	721.	728.	729.	727.	721.	712.	701.	689.	675.
660.	644.	627.	611.	596.	581.	568.	555.	542.	530.
518.	506.	492.	480.	474.	466.	454.	445.	434.	425.

STAGE

1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0
1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0
1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.1
1311.1	1311.1	1311.1	1311.1	1311.1	1311.2	1311.2	1311.2	1311.3	1311.3
1311.3	1311.3	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4
1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4
1311.4	1311.5	1311.5	1311.5	1311.5	1311.5	1311.5	1311.6	1311.6	1311.6
1311.7	1311.7	1311.8	1311.8	1311.9	1311.9	1312.0	1312.2	1312.4	1312.6
1312.9	1313.3	1313.7	1314.2	1314.7	1315.2	1315.6	1316.0	1316.3	1316.5
1316.7	1316.8	1316.8	1316.8	1316.8	1316.8	1316.8	1316.7	1316.6	1316.5
1316.3	1316.2	1316.0	1315.9	1315.8	1315.7	1315.6	1315.5	1315.4	1315.3
1315.2	1315.1	1315.0	1314.9	1314.8	1314.8	1314.7	1314.6	1314.5	1314.5

PEAK OUTFLOW IS 654. AT TIME 47.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	654.	636.	402.	167.	20074.
CMS	19.	18.	11.	5.	568.
INCHES		1.14	2.87	2.99	2.99
MM		28.85	72.91	75.86	75.86
AC-FT		315.	797.	829.	829.
THOUS CU M		389.	983.	1023.	1023.

OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

0. 400. 800. 1200. 1600. 2000 0. 0. 0. 0. 0. 0. 0.

0 30 11
1 00 21
1 30 31

2.00 41
2.30 51
3.00 61
3.30 71
4.00 81
4.30 91
5.00 101
5.30 111
6.00 121
6.30 131
7.00 141
7.30 151
8.00 161
8.30 171
9.00 181
9.30 191
10.00 201
10.30 211
11.00 221
11.30 231
12.00 241
12.30 251
13.00 261
13.30 271
14.00 281
14.30 2901
15.00 3001
15.30 3101
16.00 3201
16.30 3301
17.00 340 I
17.30 350 I
18.00 360 I
18.30 370 I
19.00 380 I
19.30 390 I
20.00 400. I
20.30 410 I
21.00 420 I
21.30 430 I
22.00 4401
22.30 4501
23.00 4601
23.30 4701
0.00 4801
0.30 4901
1.00 5001
1.30 5101
2.00 5201
2.30 5301
3.00 5401
3.30 5501
4.00 5601
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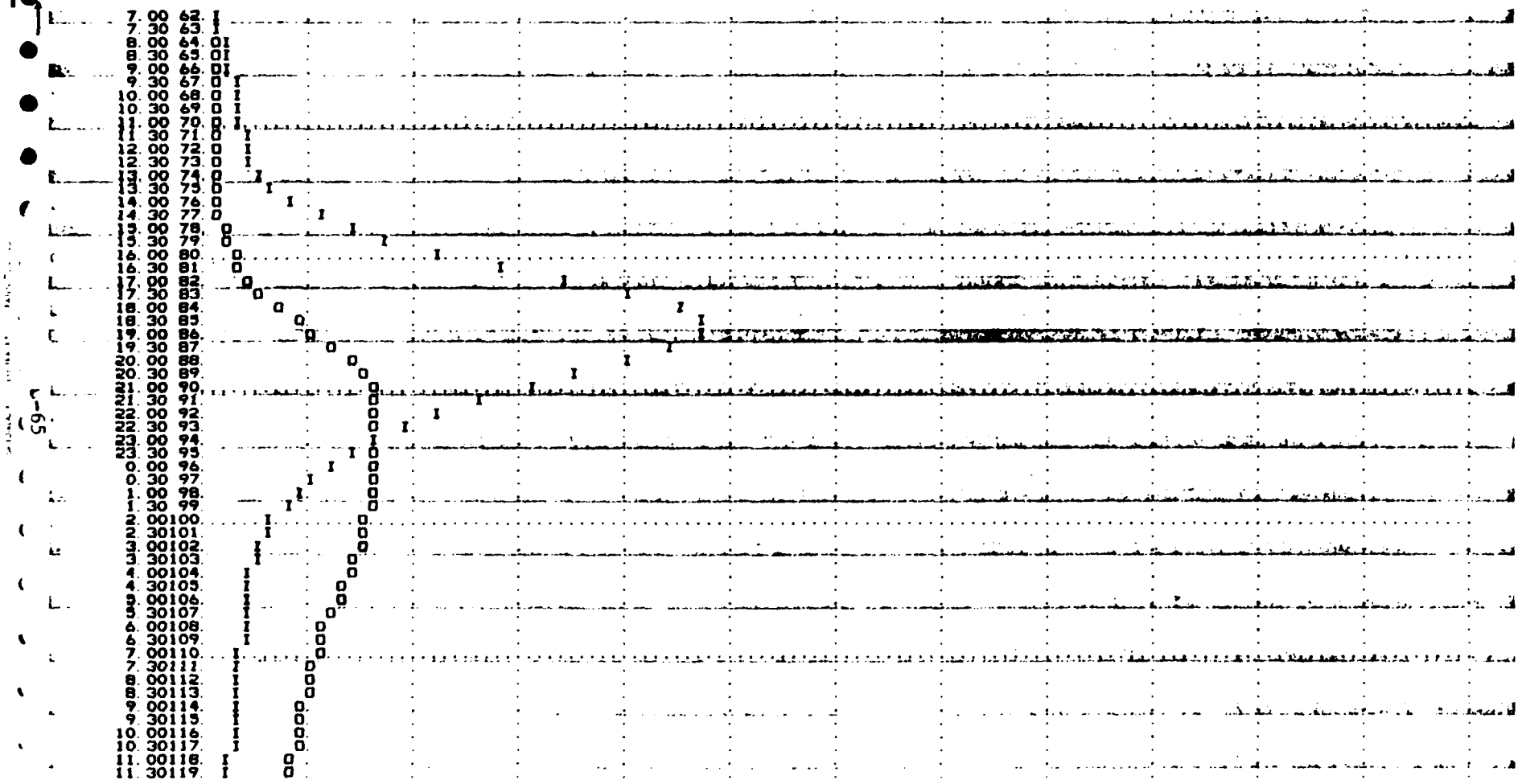
5.00 58. I
5.30 59. I
6.00 60. I
6.30 61. I


7.00 62. I
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10.30 69. O I
11.00 70. O I
11.30 71. O I
12.00 72. O I
12.30 73. O I
13.00 74. O I
13.30 75. O I
14.00 76. O I
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15.30 79. O I
16.00 80. O I
16.30 81. O I
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17.30 83. O I
18.00 84. O I
18.30 85. O I
19.00 86. O I
19.30 87. O I
20.00 88. O I
20.30 89. O I
21.00 90. O I
21.30 91. O I
22.00 92. O I
22.30 93. O I
23.00 94. O I
23.30 95. O I
0.00 96. O I
0.30 97. O I
1.00 98. O I
1.30 99. O I
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3.30103. O I
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5.00106. O I
5.30107. O I
6.00108. O I
6.30109. O I
7.00110. O I
7.30111. O I
8.00112. O I
8.30113. O I
9.00114. O I
9.30115. O I
10.00116. O I
10.30117. O I
11.00118. O I
11.30119. O I

12.00120..I.....O.

DVN

STATION 1, PLAN 1, RATIO 9

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	2.	2.	2.	2.	2.	2.	3.
3.	4.	5.	6.	7.	8.	10.	12.	13.	15.
16.	17.	18.	18.	19.	19.	20.	20.	20.	20.
20.	20.	20.	20.	21.	21.	21.	21.	22.	22.
23.	23.	24.	24.	25.	26.	28.	29.	31.	32.
34.	36.	38.	40.	43.	47.	56.	70.	87.	108.
136.	179.	230.	293.	363.	437.	532.	595.	624.	647.
663.	718.	801.	759.	679.	647.	661.	633.	644.	633.
622.	610.	597.	585.	570.	541.	514.	488.	464.	447.
433.	419.	405.	392.	379.	368.	357.	346.	336.	329.

STORAGE

0.	0.	0.	0.	0.	0.	1.	1.	1.	1.
1.	1.	1.	2.	2.	2.	2.	2.	3.	3.
3.	3.	4.	4.	4.	5.	5.	6.	6.	7.
8.	10.	12.	14.	17.	21.	25.	29.	33.	37.
40.	42.	44.	46.	47.	48.	49.	49.	50.	50.
50.	50.	50.	51.	51.	52.	53.	54.	54.	56.
57.	58.	59.	61.	63.	66.	69.	72.	76.	81.
85.	90.	95.	101.	108.	118.	132.	150.	174.	204.
243.	290.	345.	408.	474.	539.	598.	648.	689.	720.
742.	755.	758.	756.	753.	747.	738.	728.	715.	701.
685.	669.	652.	635.	619.	603.	588.	574.	561.	548.
535.	523.	512.	500.	489.	478.	468.	458.	448.	438.

STAGE

1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0
1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0
1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.1	1311.1
1311.1	1311.1	1311.1	1311.1	1311.1	1311.2	1311.2	1311.2	1311.3	1311.3
1311.3	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4
1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.5	1311.5
1311.5	1311.5	1311.5	1311.5	1311.5	1311.5	1311.6	1311.6	1311.6	1311.7
1311.7	1311.7	1311.8	1311.8	1311.9	1312.0	1312.1	1312.2	1312.4	1312.7
1313.0	1313.4	1313.8	1314.3	1314.8	1315.4	1315.8	1316.2	1316.5	1316.8
1316.9	1317.0	1317.0	1317.0	1317.0	1317.0	1316.9	1316.8	1316.7	1316.6
1316.5	1316.4	1316.2	1316.1	1316.0	1315.9	1315.7	1315.6	1315.5	1315.4
1315.3	1315.2	1315.1	1315.1	1315.0	1314.9	1314.8	1314.7	1314.6	1314.6

PEAK OUTFLOW IS 801. AT TIME 46.50 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	801.	679.	426.	177.	21276.
CMS	23.	19.	12.	5.	602.
INCHES		1.21	3.04	3.17	3.17

MM	30.78	77.30	80.41	80.41
AC-FT	337.	845.	879.	879.
THOUS CU M	415.	1043.	1084.	1084.

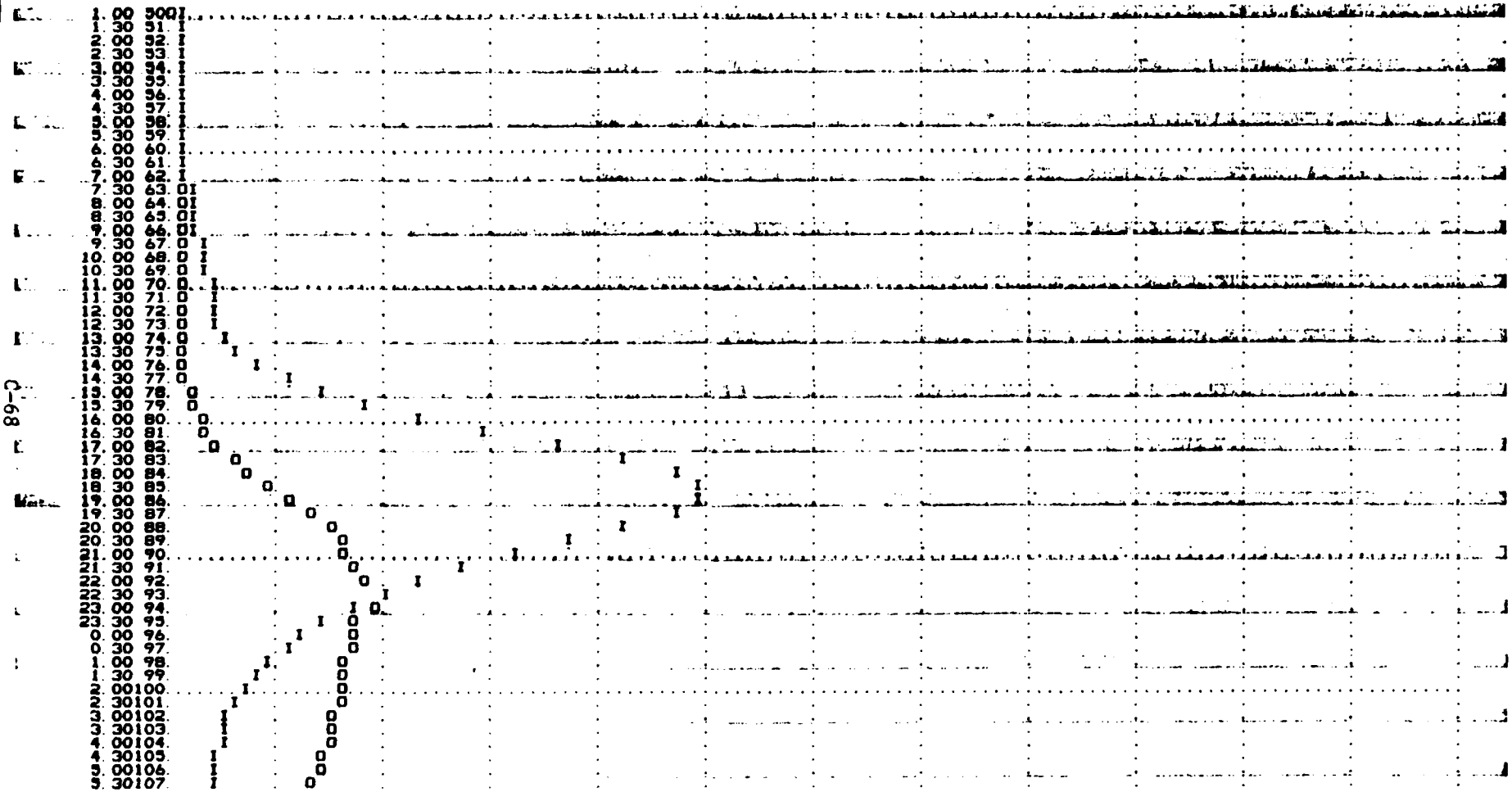
DVF

STATION I

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

0. 400. 800. 1200. 1600. 2000. 0. 0. 0. 0. 0. 0. 0.

0.30	11	
1.00	21	
1.30	31	
2.00	41	
2.30	51	
3.00	61	
3.30	71	
4.00	81	
4.30	91	
5.00	101	
5.30	111	
6.00	121	
6.30	131	
7.00	141	
7.30	151	
8.00	161	
8.30	171	
9.00	181	
9.30	191	
10.00	201	
10.30	211	
11.00	221	
11.30	231	
12.00	241	
12.30	251	
13.00	261	
13.30	271	
14.00	281	
14.30	2901	
15.00	3001	
15.30	3101	
16.00	3201	
16.30	3301	
17.00	340 I	
17.30	350 I	
18.00	360 I	
18.30	370 I	
19.00	380 I	
19.30	390 I	
20.00	400. I	
20.30	410 I	
21.00	420 I	
21.30	430 I	
22.00	4401	
22.30	4501	
23.00	4601	
23.30	4701	
0.00	4801	
0.30	4901	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5.00 58. I
5.30 59. I
6.00 60. I
6.30 61. I
7.00 62. I
7.30 63. OI
8.00 64. OI
8.30 65. OI
9.00 66. OI
9.30 67. O I
10.00 68. O I
10.30 69. O I
11.00 70. O I
11.30 71. O I
12.00 72. O I
12.30 73. O I
13.00 74. O I
13.30 75. O I
14.00 76. O I
14.30 77. O I
15.00 78. O I
15.30 79. O I
16.00 80. O I
16.30 81. O I
17.00 82. O I
17.30 83. O I
18.00 84. O I
18.30 85. O I
19.00 86. O I
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20.00 88. O I
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21.00 90. O I
21.30 91. O I
22.00 92. O I
22.30 93. O I
23.00 94. O I
23.30 95. O I
0.00 96. O I
0.30 97. O I
1.00 98. O I
1.30 99. O I
2.00100. O I
2.30101. O I
3.00102. O I
3.30103. O I
4.00104. O I
4.30105. O I
5.00106. O I
5.30107. O I

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 6.00108.  I      0
 6.30109.  I      0
 7.00110.  I      0
 7.30111.  I      0
 8.00112.  I      0
 8.30113.  I      0
 9.00114.  I      0
 9.30115.  I      0
10.00116.  I      0
10.30117.  I      0
11.00118.  I      0
11.30119.  I      0
12.00120.  I      0
```

DVN

STATION 1, PLAN 1, RATIO 6

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	2.	2.	2.	2.	2.	2.	3.	3.
4.	4.	5.	6.	7.	9.	10.	12.	14.	15.
17.	18.	19.	19.	20.	20.	21.	21.	21.	21.
21.	21.	21.	21.	21.	22.	22.	22.	23.	23.
24.	24.	25.	26.	26.	28.	29.	30.	32.	34.
36.	38.	40.	42.	45.	50.	61.	79.	93.	119.
146.	191.	244.	313.	386.	469.	577.	616.	647.	671.
1039.	1030.	945.	823.	719.	669.	663.	636.	647.	637.
626.	614.	602.	589.	577.	551.	524.	498.	474.	453.
439.	429.	411.	398.	385.	374.	363.	352.	341.	331.

STORAGE

0.	0.	0.	0.	0.	1.	1.	1.	1.	1.
1.	1.	1.	2.	2.	2.	2.	2.	3.	3.
3.	3.	4.	4.	4.	5.	5.	6.	7.	7.
9.	10.	12.	15.	18.	22.	26.	30.	34.	38.
41.	44.	46.	48.	49.	50.	51.	52.	52.	52.
52.	52.	53.	53.	54.	54.	55.	56.	57.	58.
59.	61.	62.	64.	66.	69.	72.	76.	80.	85.
89.	94.	100.	106.	113.	124.	138.	157.	182.	214.
254.	303.	361.	426.	495.	563.	625.	677.	719.	752.
768.	769.	765.	759.	755.	749.	741.	731.	719.	705.
690.	674.	658.	641.	625.	609.	594.	579.	566.	553.
541.	529.	517.	506.	495.	484.	473.	463.	453.	444.

STAGE

1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0
1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0
1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.1	1311.1
1311.1	1311.1	1311.1	1311.1	1311.2	1311.2	1311.2	1311.3	1311.3	1311.3
1311.3	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4
1311.4	1311.4	1311.4	1311.4	1311.4	1311.5	1311.5	1311.5	1311.5	1311.5
1311.5	1311.5	1311.5	1311.5	1311.6	1311.6	1311.6	1311.6	1311.7	1311.7

1311.7	1311.8	1311.8	1311.9	1311.9	1312.0	1312.1	1312.3	1312.5	1312.8	
1313.1	1313.5	1314.0	1314.5	1315.0	1315.5	1316.0	1316.4	1316.7	1317.0	
1317.1	1317.1	1317.1	1317.1	1317.0	1317.0	1316.9	1316.8	1316.7	1316.6	
1316.5	1316.4	1316.3	1316.1	1316.0	1315.9	1315.8	1315.7	1315.6	1315.5	
1315.4	1315.3	1315.2	1315.1	1315.0	1314.9	1314.8	1314.9	1314.7	1314.6	

PEAK OUTFLOW IS 1050. AT TIME 46.00 HOURS

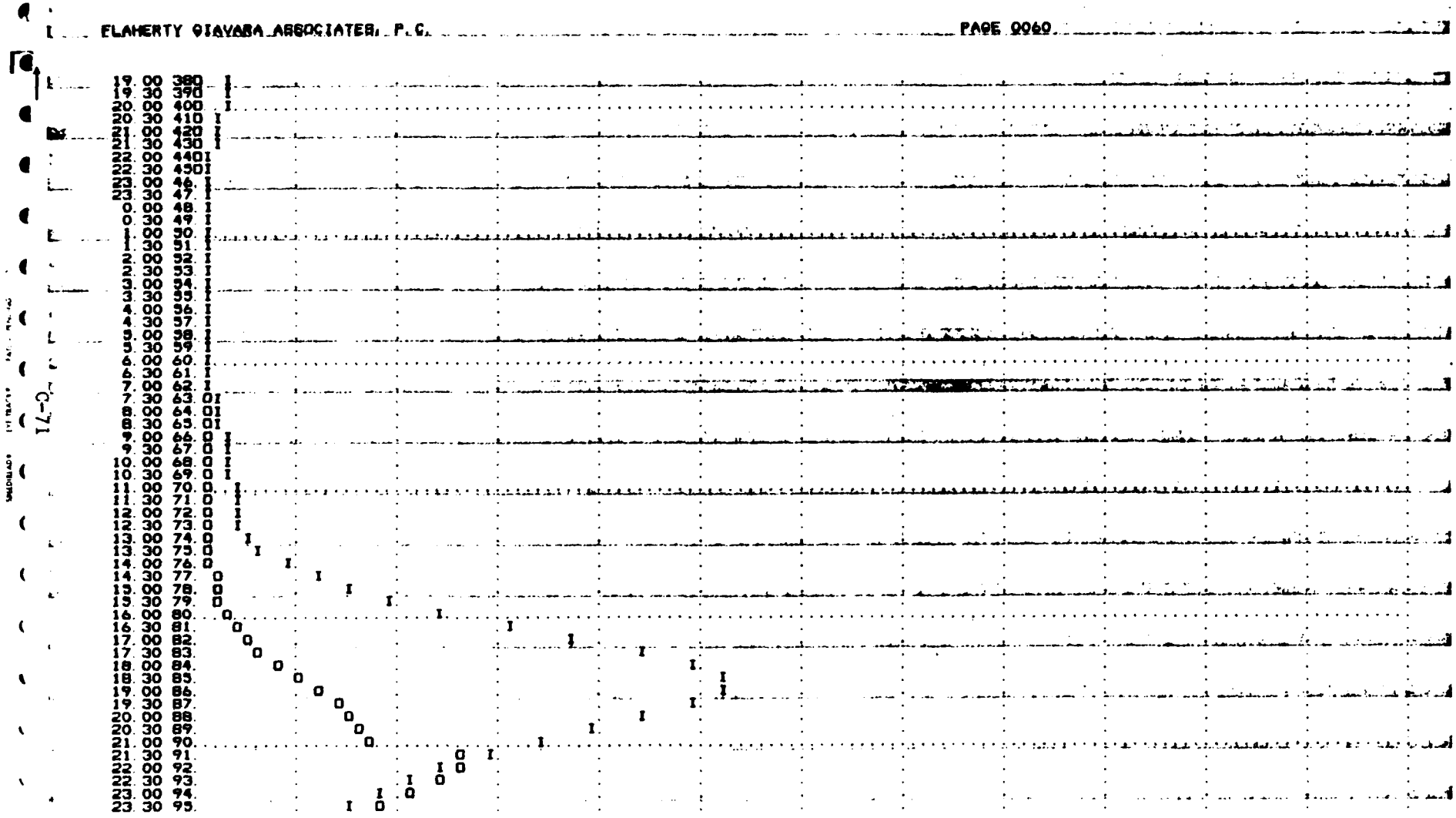
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1050.	763.	454.	189.	22666.
CMS	30.	22.	13.	5.	642.
INCHES		1.36	3.24	3.37	3.37
MM		34.59	82.41	85.66	85.66
AC-FT		378.	901.	937.	937.
THOUS CU M		466.	1111.	1155.	1155.

OVF STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

0. 400. 800. 1200. 1600. 2000. 2400.

0.30	11	
1.00	21	
1.30	31	
2.00	41	
2.30	51	
3.00	61	
3.30	71	
4.00	81	
4.30	91	
5.00	101	
5.30	111	
6.00	121	
6.30	131	
7.00	141	
7.30	151	
8.00	161	
8.30	171	
9.00	181	
9.30	191	
10.00	201	
10.30	211	
11.00	221	
11.30	231	
12.00	241	
12.30	251	
13.00	261	
13.30	271	
14.00	281	
14.30	290I	
15.00	300I	
15.30	310I	
16.00	320I	
16.30	330 I	
17.00	340 I	
17.30	350 I	
18.00	360 I	
18.30	370 I	


19.00 380
19.30 390
20.00 400
20.30 410
21.00 420
21.30 430
22.00 440
22.30 450
23.00 46.
23.30 47.
0.00 48.
0.30 49.
1.00 50.
1.30 51.
2.00 52.
2.30 53.
3.00 54.
3.30 55.
4.00 56.
4.30 57.
5.00 58.
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6.00 60.
6.30 61.
7.00 62.
7.30 63.
8.00 64.
8.30 65.
9.00 66.
9.30 67.
10.00 68.
10.30 69.
11.00 70.
11.30 71.
12.00 72.
12.30 73.
13.00 74.
13.30 75.
14.00 76.
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15.30 79.
16.00 80.
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17.00 82.
17.30 83.
18.00 84.
18.30 85.
19.00 86.
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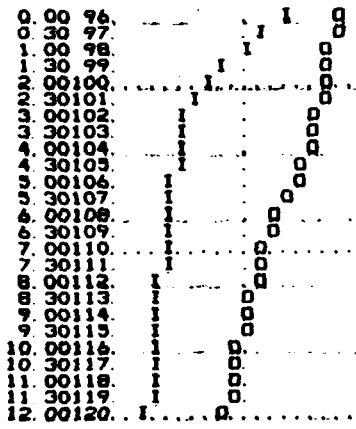
21.30 91.
22.00 92.
22.30 93.
23.00 94.
23.30 95.



OVN

STATION 1, PLAN 1, RATIO 7

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.	1.	1.	1.	1.	1.	2.	2.	3.	3.
1.	2.	2.	2.	2.	2.	2.	2.	3.	3.
4.	4.	5.	6.	8.	9.	11.	13.	14.	16.
17.	19.	19.	20.	21.	21.	21.	22.	22.	22.
22.	22.	22.	23.	22.	23.	23.	23.	24.	24.
25.	25.	26.	27.	28.	29.	30.	32.	33.	33.
37.	39.	42.	44.	47.	55.	65.	80.	98.	122.
156.	203.	260.	333.	411.	512.	597.	637.	670.	1207.
1274.	1154.	1000.	862.	746.	670.	665.	658.	650.	640.
629.	618.	605.	593.	581.	562.	534.	508.	484.	460.
445.	431.	418.	404.	391.	379.	368.	357.	347.	337.

STORAGE

0.	0.	0.	0.	0.	1.	1.	1.	1.	1.
1.	1.	2.	2.	2.	2.	2.	3.	3.	3.
3.	4.	4.	4.	5.	5.	6.	6.	7.	8.
9.	11.	13.	16.	19.	23.	27.	32.	36.	40.
43.	46.	49.	50.	52.	53.	54.	54.	55.	55.
55.	55.	55.	56.	56.	57.	58.	59.	60.	61.
62.	63.	65.	67.	69.	72.	75.	79.	84.	89.
93.	99.	104.	110.	119.	129.	144.	164.	190.	223.
265.	316.	377.	445.	517.	587.	651.	706.	751.	774.

777.	773.	767.	761.	756.	751.	744.	735.	723.	710.
695.	679.	663.	647.	630.	615.	599.	585.	571.	558.
546.	534.	522.	511.	500.	489.	479.	468.	458.	449.

STAGE

1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0
1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0
1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.1	1311.1	1311.1
1311.1	1311.1	1311.1	1311.1	1311.2	1311.2	1311.2	1311.3	1311.3	1311.3
1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.4	1311.5	1311.5	1311.5
1311.5	1311.5	1311.5	1311.5	1311.5	1311.5	1311.5	1311.5	1311.5	1311.5
1311.5	1311.5	1311.5	1311.6	1311.6	1311.6	1311.6	1311.7	1311.7	1311.7
1311.8	1311.8	1311.9	1311.9	1312.0	1312.1	1312.2	1312.4	1312.6	1312.8
1313.2	1313.6	1314.1	1314.6	1315.2	1315.7	1316.2	1316.6	1317.0	1317.2
1317.2	1317.2	1317.1	1317.1	1317.0	1317.0	1316.9	1316.9	1316.8	1316.7
1316.6	1316.4	1316.3	1316.2	1316.1	1315.9	1315.8	1315.7	1315.6	1315.5
1319.4	1319.3	1319.2	1319.1	1319.1	1319.0	1314.9	1314.8	1314.7	1314.6

PEAK OUTFLOW IS 1274. AT TIME 45.50 HOURS

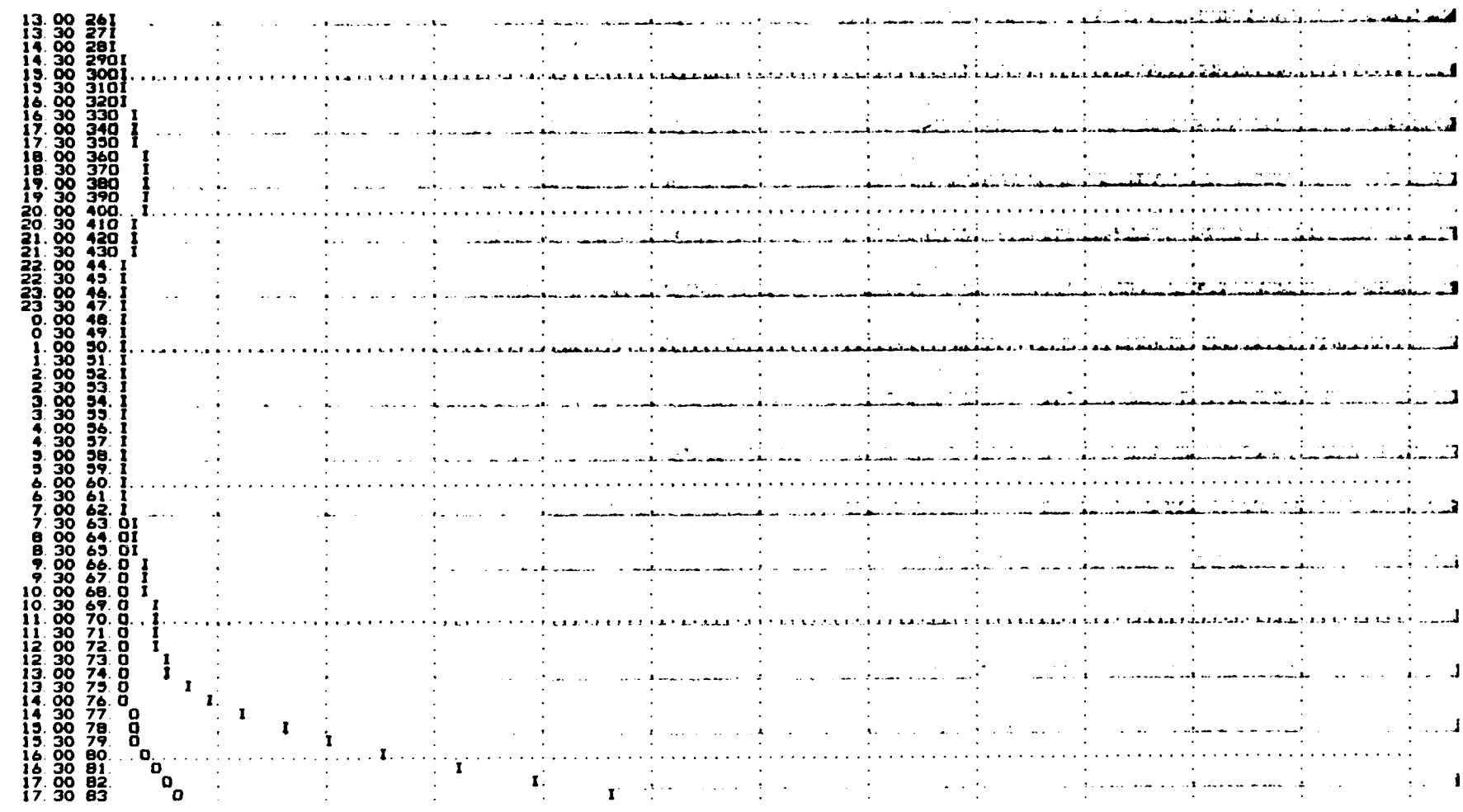
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1274.	850.	483.	201.	24066.
CMS	36.	24.	14.	6.	681.
INCHES		1.52	3.45	3.58	3.58
MM		38.53	87.64	90.99	90.99
AC-FT		421.	957.	994.	994.
THOUS CU M		520.	1181.	1227.	1227.

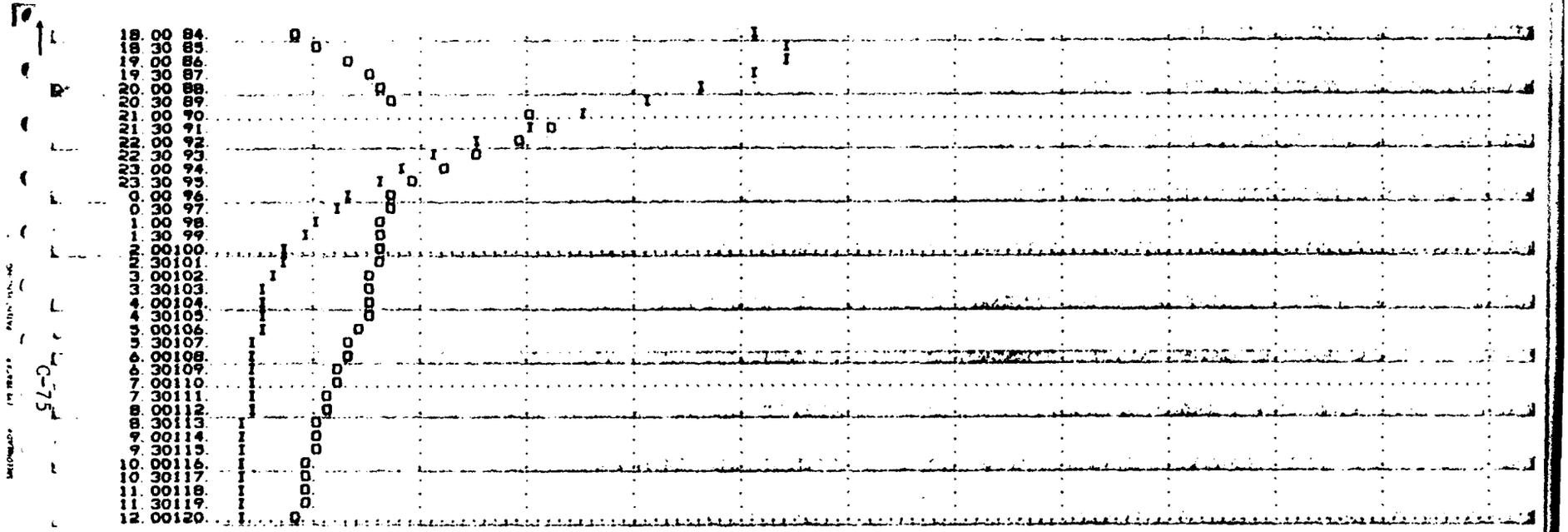
OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(#)

	0.	400.	800.	1200.	1600.	2000.	2400.	0.	0.	0.	0.	0.	0.
0.30	11												
1.00	21												
1.30	31												
2.00	41												
2.30	51												
3.00	61												
3.30	71												
4.00	81												
4.30	91												
5.00	101												
5.30	111												
6.00	121												
6.30	131												
7.00	141												
7.30	151												
8.00	161												
8.30	171												
9.00	181												
9.30	191												
10.00	201												
10.30	211												
11.00	221												
11.30	231												
12.00	241												
12.30	251												


13.00 261
13.30 271
14.00 281
14.30 290I
15.00 300I
15.30 310I
16.00 320I
16.30 330 I
17.00 340 I
17.30 350 I
18.00 360 I
18.30 370 I
19.00 380 I
19.30 390 I
20.00 400 I
20.30 410 I
21.00 420 I
21.30 430 I
22.00 44 I
22.30 45 I
23.00 46 I
23.30 47 I
0.00 48 I
0.30 49 I
1.00 50 I
1.30 51 I
2.00 52 I
2.30 53 I
3.00 54 I
3.30 55 I
4.00 56 I
4.30 57 I
5.00 58 I
5.30 59 I
6.00 60 I
6.30 61 I
7.00 62 I
7.30 63 OI
8.00 64 OI
8.30 65 OI
9.00 66 O I
9.30 67 O I
10.00 68 O I
10.30 69 O I
11.00 70 O I
11.30 71 O I
12.00 72 O I
12.30 73 O I
13.00 74 O I
13.30 75 O I
14.00 76 O I
14.30 77 O I
15.00 78 O I
15.30 79 O I
16.00 80 O I
16.30 81 O I
17.00 82 O I
17.30 83 O I



DVN

STATION 1, PLAN 1, RATIO 8

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	1.	1.	1.	1.	1.
1.	1.	1.	2.	2.	2.	2.	2.	3.	3.
3.	3.	4.	4.	4.	5.	5.	5.	6.	7.
8.	10.	11.	14.	17.	20.	24.	28.	32.	35.
38.	40.	42.	44.	45.	46.	47.	47.	47.	48.
48.	48.	48.	49.	50.	51.	52.	54.	55.	57.
59.	60.	63.	66.	69.	73.	78.	84.	90.	97.
104.	112.	119.	128.	141.	161.	189.	227.	281.	354.
451.	601.	1170.	3662.	4486.	4688.	4585.	4259.	3826.	3360.
2901.	2481.	2116.	1808.	1551.	1337.	1157.	1006.	876.	766.
671.	667.	661.	655.	648.	641.	633.	626.	618.	609.

601.	593.	584.	573.	522.	534.	518.	496.	477.	460.	

STORAGE

0.	0.	1.	1.	1.	1.	2.	2.	2.	3.	
3.	3.	4.	4.	4.	5.	5.	6.	6.	7.	
8.	8.	9.	10.	11.	11.	12.	14.	15.	18.	
20.	24.	29.	35.	42.	50.	60.	70.	79.	88.	
95.	101.	106.	110.	113.	116.	117.	118.	119.	119.	
120.	120.	121.	122.	123.	124.	126.	128.	130.	133.	
135.	138.	141.	145.	149.	155.	162.	170.	179.	189.	
199.	209.	220.	232.	248.	270.	301.	343.	397.	469.	
551.	657.	773.	848.	869.	874.	871.	863.	852.	840.	
827.	813.	804.	795.	786.	779.	773.	767.	762.	757.	
752.	747.	739.	730.	720.	711.	701.	690.	679.	668.	
657.	646.	634.	622.	611.	599.	589.	578.	568.	558.	

STAGE

1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0
1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.1	1311.1
1311.1	1311.1	1311.1	1311.1	1311.1	1311.1	1311.1	1311.1	1311.1	1311.1
1311.2	1311.2	1311.2	1311.3	1311.3	1311.4	1311.5	1311.6	1311.7	1311.7
1311.8	1311.8	1311.9	1311.9	1311.9	1312.0	1312.0	1312.0	1312.0	1312.0
1312.0	1312.0	1312.0	1312.0	1312.0	1312.0	1312.0	1312.1	1312.1	1312.1
1312.1	1312.1	1312.2	1312.2	1312.2	1312.3	1312.3	1312.4	1312.5	1312.6
1312.6	1312.7	1312.8	1312.9	1313.0	1313.2	1313.3	1313.5	1313.6	1313.8
1313.5	1316.3	1317.2	1317.7	1317.9	1317.9	1317.9	1317.8	1317.8	1317.7
1317.6	1317.5	1317.4	1317.3	1317.3	1317.2	1317.2	1317.1	1317.1	1317.0
1317.0	1317.0	1316.9	1316.8	1316.8	1316.7	1316.6	1316.5	1316.4	1316.4
1316.3	1316.2	1316.1	1316.0	1315.9	1315.8	1315.7	1315.7	1315.6	1315.5

PEAK OUTFLOW IS 4688. AT TIME 43.00 HOURS

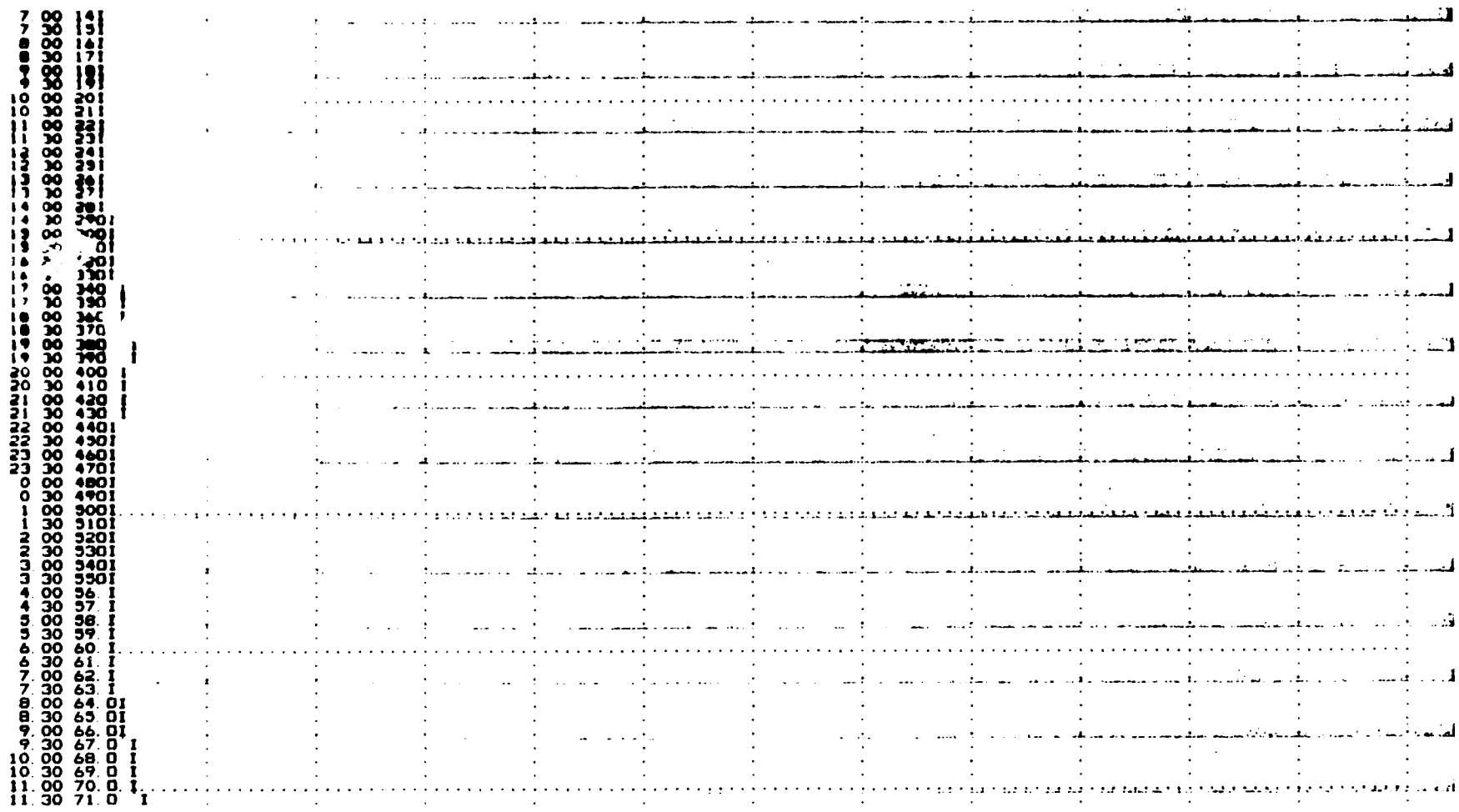
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4688.	3294.	1257.	520.	62459.
CMS	133.	93.	36.	15.	1769.
INCHES		5.88	8.98	9.29	9.29
MM		149.41	228.02	236.03	236.03
AC-FT		1634.	2493.	2581.	2581.
THOUS CU M		2015.	3075.	3184.	3184.

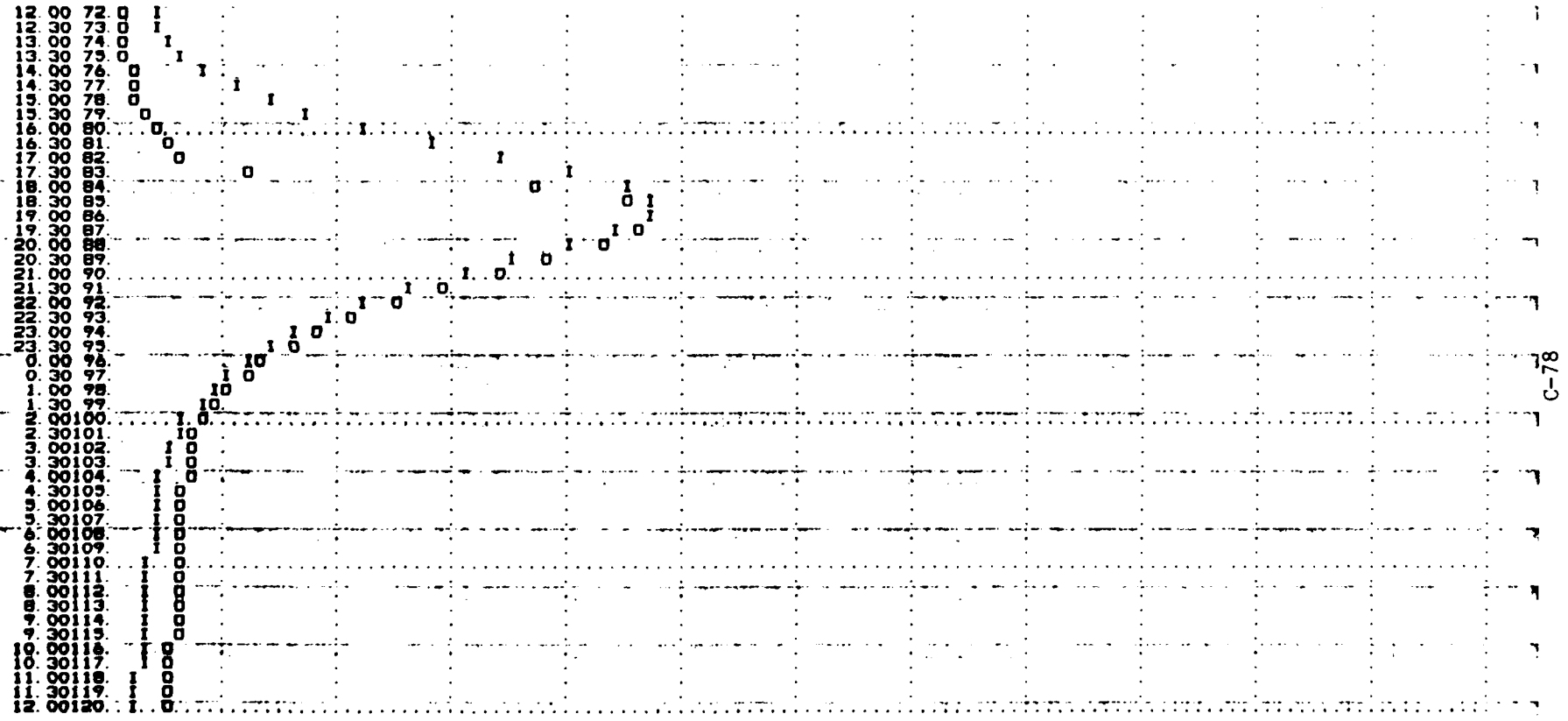
OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0.	1000.	2000.	3000.	4000.	5000.	Q	Q	Q	Q	Q	Q	Q
0 30	1I												
1.00	2I												
1 30	3I												
2.00	4I												
2 30	5I												
3.00	6I												
3 30	7I												
4.00	8I												
4 30	9I												
5.00	10I												
5 30	11I												
6.00	12I												
6 30	13I												


7 00 141
7 30 151
8 00 161
8 30 171
9 00 181
9 30 191
10 00 201
10 30 211
11 00 221
11 30 231
12 00 241
12 30 251
13 00 261
13 30 271
14 00 281
14 30 291
15 00 301
15 30 311
16 00 321
16 30 331
17 00 341
17 30 351
18 00 361
18 30 371
19 00 381
19 30 391
20 00 401
20 30 411
21 00 421
21 30 431
22 00 4401
22 30 4501
23 00 4601
23 30 4701
0 00 4801
0 30 4901
1 00 5001
1 30 5101
2 00 5201
2 30 5301
3 00 5401
3 30 5501
4 00 56
4 30 57
5 00 58
5 30 59
6 00 60
6 30 61
7 00 62
7 30 63
8 00 64
8 30 65
9 00 66
9 30 67
10 00 68
10 30 69
11 00 70
11 30 71



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STATION 1, PLAN 1, RATIO 9

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	1.	1.	1.	1.	2.	2.	2.
2.	3.	3.	3.	4.	4.	4.	5.	5.	6.
6.	7.	7.	8.	9.	9.	10.	11.	12.	14.
16.	19.	23.	28.	34.	40.	48.	62.	79.	87.
97.	105.	112.	117.	120.	123.	124.	125.	125.	125.
124.	124.	124.	124.	125.	127.	128.	131.	133.	136.
139.	144.	148.	155.	163.	172.	184.	198.	213.	229.
246.	269.	286.	311.	342.	387.	455.	583.	660.	2871.
4736.	6217.	7493.	8539.	9233.	9436.	9115.	8381.	7458.	6516.
5588.	4803.	4138.	3538.	3032.	2611.	2257.	1958.	1698.	1470.
1278.	1123.	1004.	925.	876.	838.	804.	773.	743.	714.
687.	671.	670.	667.	664.	661.	656.	652.	647.	641.

STORAGE

0.	1.	1.	2.	2.	3.	3.	4.	4.	5.
6.	7.	7.	8.	9.	10.	11.	12.	13.	14.
16.	17.	18.	20.	21.	23.	25.	28.	31.	35.
41.	48.	58.	70.	84.	101.	120.	139.	158.	174.
188.	200.	209.	216.	221.	224.	226.	227.	227.	227.
227.	226.	226.	227.	228.	230.	232.	235.	239.	243.
247.	251.	257.	263.	272.	283.	295.	310.	327.	344.
363.	382.	402.	425.	454.	496.	554.	633.	736.	826.
875.	904.	926.	944.	955.	959.	953.	941.	926.	909.
893.	877.	860.	845.	831.	819.	809.	800.	791.	784.
777.	771.	767.	764.	762.	760.	759.	757.	756.	754.
753.	752.	750.	747.	743.	738.	732.	726.	719.	711.

STAGE

1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0	1311.0
1311.0	1311.1	1311.1	1311.1	1311.1	1311.1	1311.1	1311.1	1311.1	1311.1
1311.1	1311.1	1311.2	1311.2	1311.2	1311.2	1311.2	1311.2	1311.3	1311.3
1311.3	1311.4	1311.5	1311.6	1311.7	1311.8	1312.0	1312.2	1312.3	1312.4
1312.6	1312.7	1312.7	1312.8	1312.8	1312.8	1312.9	1312.9	1312.9	1312.9
1312.9	1312.9	1312.9	1312.9	1312.9	1312.9	1312.9	1312.9	1313.0	1313.0
1313.0	1313.1	1313.1	1313.2	1313.2	1313.3	1313.4	1313.5	1313.7	1313.8
1314.0	1314.1	1314.3	1314.5	1314.7	1315.0	1315.3	1316.1	1316.9	1317.6
1317.9	1318.1	1318.3	1318.4	1318.5	1318.6	1318.5	1318.4	1318.3	1318.2
1318.1	1317.9	1317.8	1317.7	1317.6	1317.5	1317.4	1317.4	1317.3	1317.2
1317.2	1317.1	1317.1	1317.1	1317.1	1317.1	1317.0	1317.0	1317.0	1317.0
1317.0	1317.0	1317.0	1317.0	1316.9	1316.9	1316.8	1316.8	1316.7	1316.7

PEAK OUTFLOW IS 9436. AT TIME 43.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	9436.	7269.	2701.	1123.	134772.
CMS	267.	206.	76.	32.	3816.
INCHES		12.98	19.29	20.05	20.05
MM		329.65	489.89	509.34	509.34
AC-FT		3604.	5356.	5569.	5569.
THOUS CU M		4446.	6607.	6869.	6869.

OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

0. 2000. 4000. 6000. 8000. 10000. 0. 0. 0. 0. 0. 0. 0.

0 30 II

C-79

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 1.00  2I
 1.30  3I
 2.00  4I
 2.30  5I
 3.00  6I
 3.30  7I
 4.00  8I
 4.30  9I
 5.00 10I.....
 5.30 11I
 6.00 12I
 6.30 13I
 7.00 14I
 7.30 15I
 8.00 16I
 8.30 17I
 9.00 18I
 9.30 19I
10.00 20I.....
10.30 21I
11.00 22I
11.30 23I
12.00 24I
12.30 25I
13.00 26I
13.30 27I
14.00 28I
14.30 29OI
15.00 30OI.....
15.30 31OI
16.00 32OI
16.30 33OI
17.00 340 I
17.30 350 I
18.00 360 I
18.30 370  I
19.00 380  I
19.30 390  I
20.00 400. I.....
20.30 410 I
21.00 42. OI
21.30 43. OI
22.00 44. I
22.30 45. I
23.00 46. I
23.30 47. I
 0.00 48. I
 0.30 49. I
 1.00 50. I.....
 1.30 51. I
 2.00 52. I
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 4.30 57. I
 5.00 58. I
 5.30 59. I
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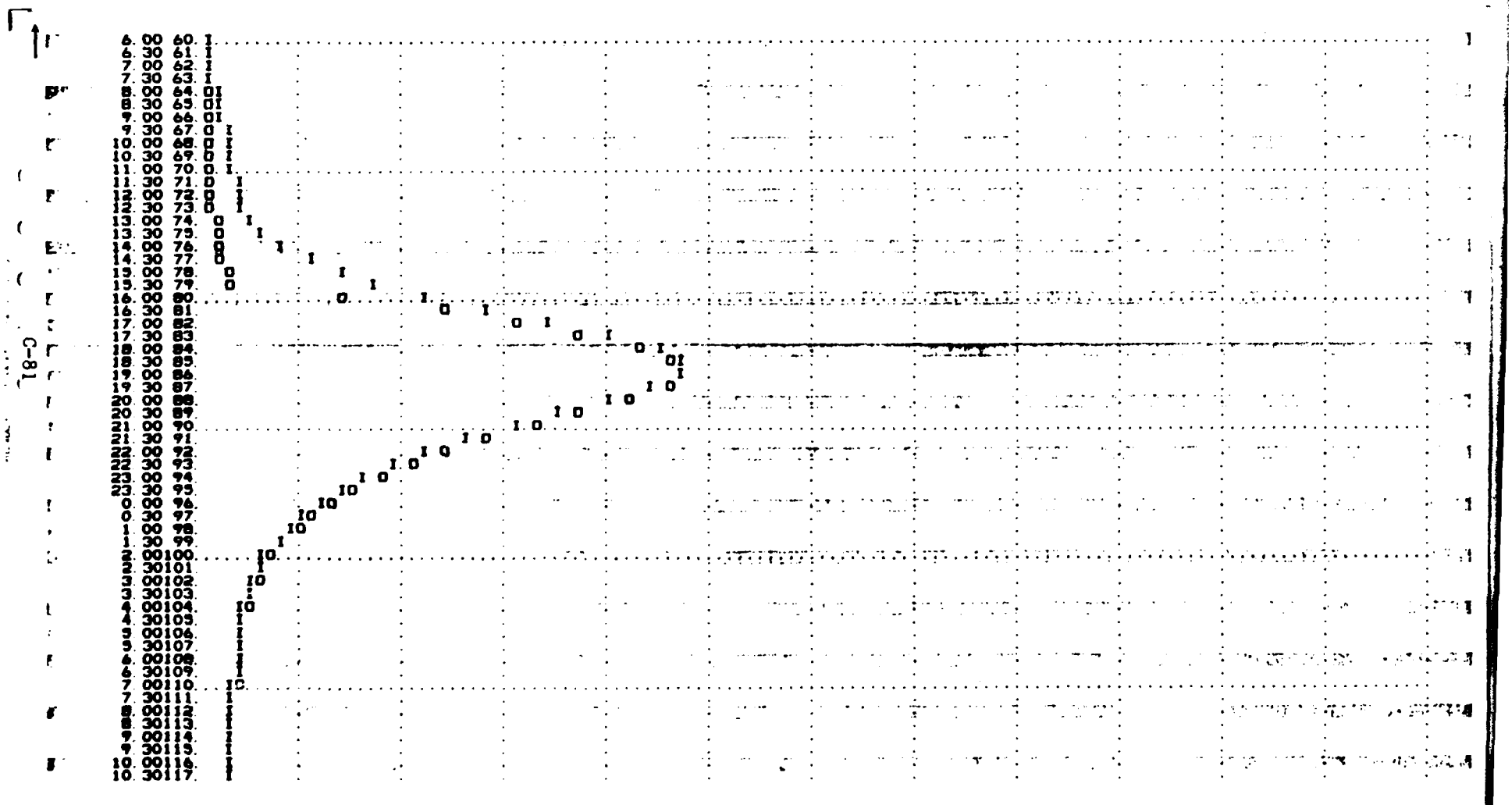
6.00 60.I
6.30 61.I
7.00 62.I
7.30 63.I
8.00 64.OI
8.30 65.OI
9.00 66.OI
9.30 67.O I
10.00 68.O I
10.30 69.O I
11.00 70.O I
11.30 71.O I
12.00 72.O I
12.30 73.O I
13.00 74. O I
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14.00 76. O I
14.30 77. O I
15.00 78. O I
15.30 79. O I
16.00 80. O I
16.30 81. O I
17.00 82. O I
17.30 83. O I
18.00 84. O I
18.30 85. OI
19.00 86. I
19.30 87. I O
20.00 88. I O
20.30 89. I O
21.00 90. I O
21.30 91. I O
22.00 92. I O
22.30 93. I O
23.00 94. I O
23.30 95. I O
0.00 96. IO
0.30 97. IO
1.00 98. IO
1.30 99. I
2.00100. IO
2.30101. I
3.00102. IO
3.30103. I
4.00104. IO
4.30105. I
5.00106. I
5.30107. I
6.00108. I
6.30109. I
7.00110. IO
7.30111. I
8.00112. I
8.30113. I
9.00114. I
9.30115. I
10.00116. I
10.30117. I
C-81

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11.00118. IO
11.30119. IO
12.00120. IO
```

OVN

********** ********** ********** ********** **********

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 0.10	RATIO 2 0.18	RATIO 3 0.19	RATIO 4 0.20	RATIO 5 0.21	RATIO 6 0.22	RATIO 7 0.23	RATIO 8 0.50	RATIO 9 1.00
HYDROGRAPH AT	1	1.69	1	345.	621.	655.	690.	724.	759.	793.	1725.	3449.
		(4.90)		(9.77)(	17.58)(	18.56)(	19.54)(	20.51)(	21.49)(	22.47)(	48.84)(	97.68)
HYDROGRAPH AT	1	3.32	1	603.	1085.	1146.	1206.	1266.	1327.	1387.	3015.	6031.
		(8.60)		(17.08)(	30.74)(	32.45)(	34.15)(	35.86)(	37.57)(	39.28)(	85.38)(	170.77)
2 COMBINED	1	5.21	1	942.	1696.	1790.	1884.	1979.	2073.	2167.	4711.	9422.
		(13.49)		(26.68)(	48.02)(	50.69)(	53.36)(	56.03)(	58.69)(	61.36)(	133.39)(	266.79)
ROUTED TO	1	5.21	1	277.	603.	628.	654.	801.	1050.	1274.	4688.	9438.
		(13.49)		(7.85)(	17.07)(	17.79)(	18.52)(	22.68)(	29.74)(	36.09)(	132.76)(	267.19)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1311.00	1311.00	1317.00
STORAGE	0.	0.	752.
OUTFLOW	0.	0.	671.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.10	1314.21	0.00	393.	277.	0.00	47.50	0.00
0.18	1316.29	0.00	659.	603.	0.00	47.00	0.00
0.19	1316.55	0.00	694.	628.	0.00	47.00	0.00
0.20	1316.82	0.00	729.	654.	0.00	47.00	0.00
0.21	1317.05	0.05	758.	801.	2.00	46.50	0.00
0.22	1317.12	0.12	769.	1050.	2.50	46.00	0.00
0.23	1317.19	0.19	777.	1274.	3.00	45.50	0.00
0.50	1317.92	0.92	874.	4688.	9.00	43.00	0.00
1.00	1318.55	1.55	959.	9436.	16.00	43.00	0.00

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)

DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
****

APPENDIX D

PREVIOUS INSPECTION REPORTS/AVAILABLE DOCUMENTS

DATA SUMMARY SHEET

KINGSLEY RESERVOIR GATE CHAMBER -

July 25, 1952

Four new 8" diameter gate valves, flanged, were installed on above date, by Mr. C. M. Osland, Canal Maintenance Foreman.

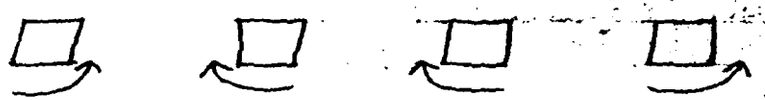
Valve #1 - Fairbanks - 125 lb.
Valve #2 - Ludlow - 125 "
Valve #3 - P & C - 125 "
Valve #4 - Kennedy - 125 "

When standing in valve chamber, facing dam, #1 Valve is on your left.

Valves are W.W.#2 surplus stock from Lyons Dry Dock.

Butterfly Valves

Valve #1 Valve #2 Valve #3 Valve #4



To close butterfly valves turn as indicated.

KINGSLEY BROOK.

Reservoir: Area - 113 acres.
Depth - 20 ft.

Watershed: Area - 4.68 square miles of hilly wooded country.

Dam: Earth embankment across a branch of the Chenango River.

Completed: 1867

Capacity: 98,445,600 cubic feet.

Original Cost: $ 80,481.25
(3 - 9" gate valves)

Elevation: 1350 ±

Valves in tunnel.

Length of feeder 1.87 miles.

Channels to Destination: Reaches Oriskany Creek via Kingsley and Chenango Feeders and Chenango canal; thence along Oriskany Creek to the Mohawk River at Oriskany and via Mohawk River to Barge canal at Frankfort. Not used for at least 10 years (in 1959) to feed Canal.

Width of Spillway 17.5	**4-8" ? pipes**
Elevation of Spillway crest	**1332.60**
" " **Discharge tunnel**	**1277.41 (floor)**
" " " "	**1284.41 (top)**

Kingsley Feeder not used Chenango feeder is used

PREVIOUS REPORTS

Form IW31. 11-6-14-1000 (16-1038) Acc. 38a

(NOTICE: After filling out one of these forms as completely as possible for each dam in your district, return it at once to the Conservation Commission, Albany.)

STATE OF NEW YORK

CONSERVATION COMMISSION

ALBANY

Reservoir

Map 164 – C ~~DAM~~ REPORT

July 6 (Date), 1917

CONSERVATION COMMISSION,

DIVISION OF INLAND WATERS.

GENTLEMEN:

I have the honor to make the following report in relation to the structure known as the Kingsley Brook Reservoir ~~Dam~~.

This ~~dam~~ Reservoir is situated upon the Kingsley Brook (Give name of stream)

in the Town of Randallsville, ~~Madison~~ Madison County,

about 2½ (State distance) from the Village or City of Randallsville.

The distance down (Up or down) stream from the ~~dam~~ reservoir, to the village of Randallsville (Give name of nearest important stream or of a bridge)

is about 3 miles (State distance).

The dam is now owned by State (Give name and address in full)

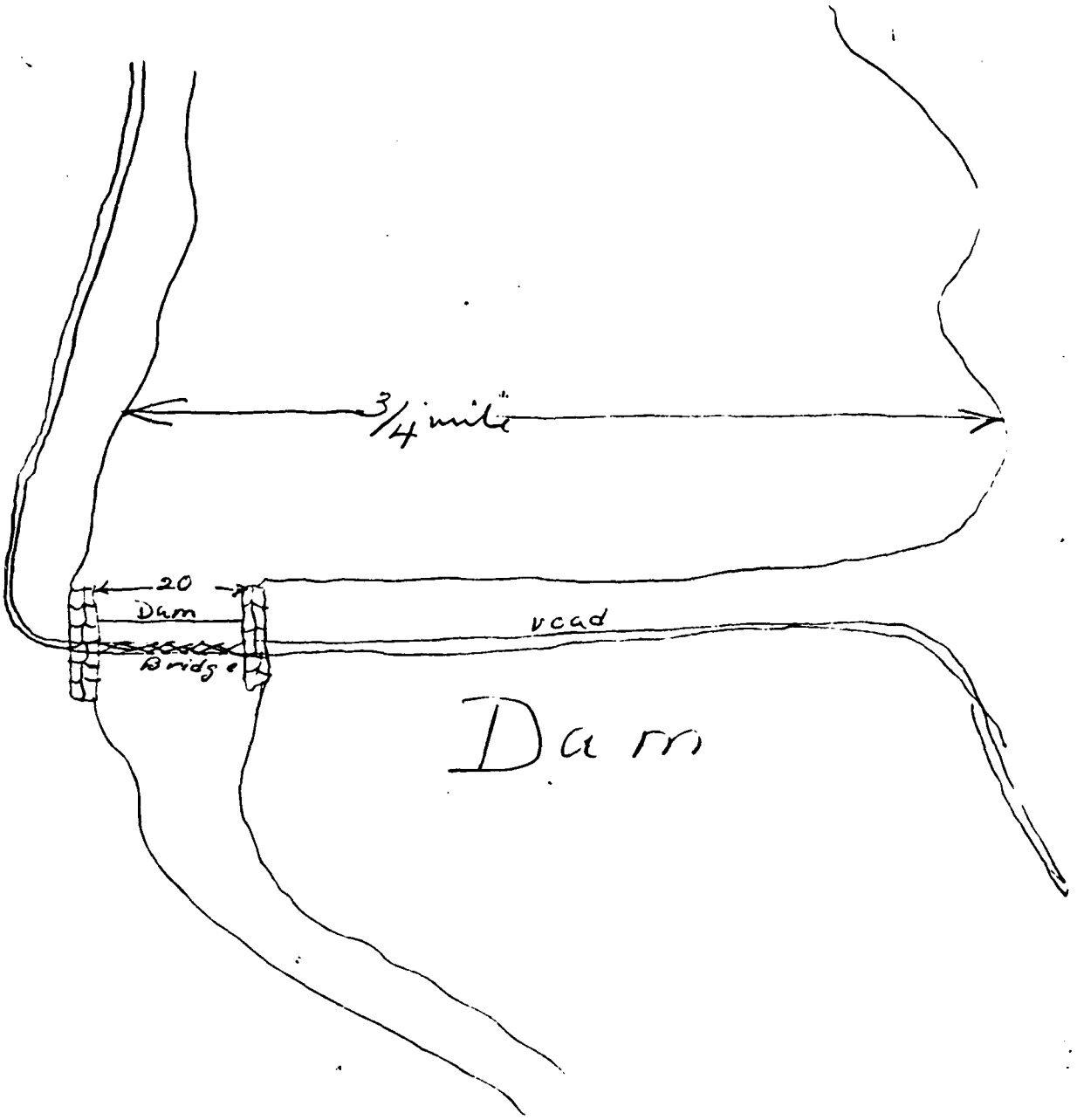
and was built in or about the year ——, and was extensively repaired or reconstructed during the year ——.

As it now stands, the spillway portion of this dam is built of natural rock (State whether of masonry, concrete or timber)

and the other portions are built of masonry (State whether of masonry, concrete, earth or timber with or without rock fill)

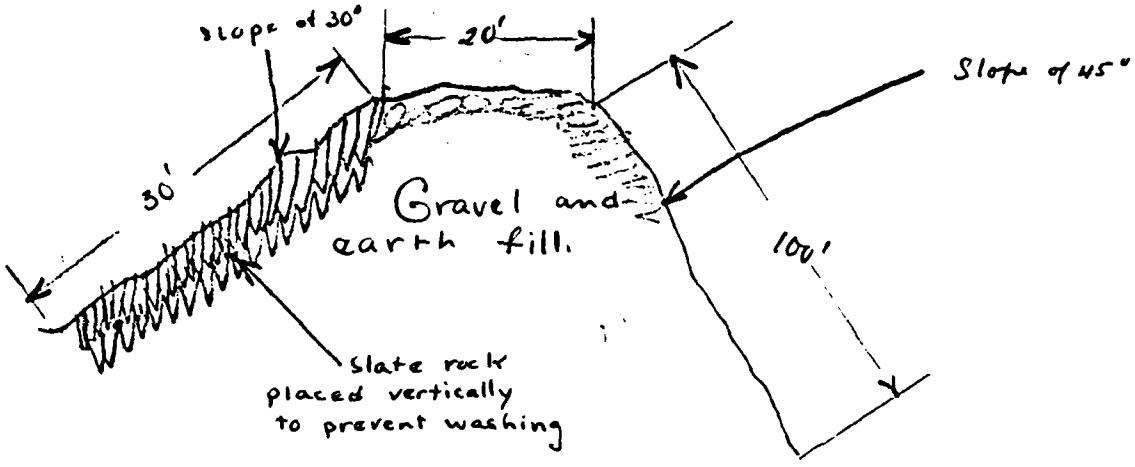
As nearly as I can learn, the character of the foundation bed under the spillway portion of the dam is gravel and under the remaining portions such foundation bed is gravel.

(In the space below, make a third sketch showing the general plan of the dam, and its approximate position in relation to buildings or other conspicuous objects in the vicinity.)

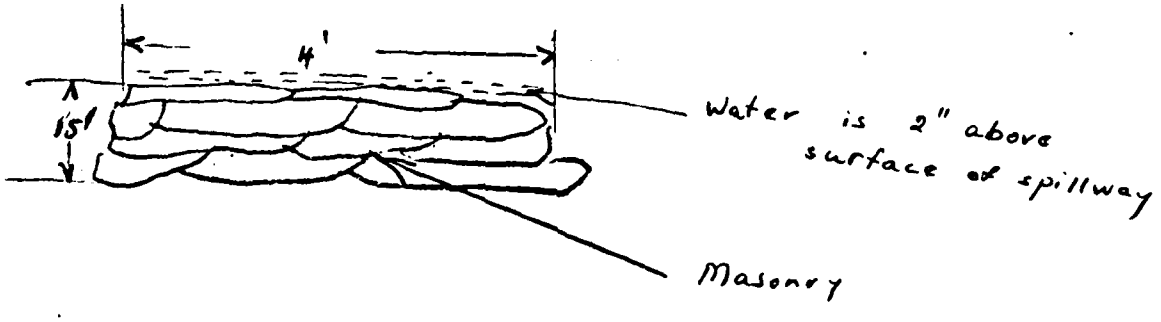


(In the space below, make one sketch showing the form and dimensions of a cross section through the spillway or waste-weir of this dam, and a second sketch showing the same information for a cross section through the other portion of the dam. Show particularly the greatest height of the dam above the stream bed, its thickness at the top, and thickness at the bottom, as nearly as you can learn.)

Cross-section of dam embankment.



Cross-section of spillway portion.



The abutments are masonry and are 5' above crest of water.

The total length of this dam is 3/4 mile feet. The spillway or waste-weir portion, is about 20 feet long, and the crest of the spillway is about 12 feet below the top of the dam.

The number, size and location of discharge pipes, waste pipes or gates which may be used for drawing off the water from behind the dam, are as follows: There is only the spillway which acts as overflow.

At the time of this inspection the water level above the dam was 6 ft. 3 in. ~~below~~ above ~~the crest of the spillway.~~ (overflow)

(State briefly, in the space below, whether, in your judgment, this dam is in good condition, or bad condition, describing particularly any leaks or cracks which you may have observed.)

This reservoir is in very good condition.

Reported by Willard Botsford
(Signature)

Conservation Commission, Albany, N.Y.
(Address—Street and number, P. O. Box or R. P. D. route)

Hamilton, N.Y.
(Name of place)

PREVIOUS INSPECTION REPORTS

DEC DAM INSPECTION REPORT

RB	CTY	YR. AP.	DAM NO.	INS. DATE	USE	TYPE
16	27	81	00698	82712	03	3

AS BUILT INSPECTION

- [1] Location of Spillway and outlet
- [1] Size of Spillway and outlet
- [1] Elevations
- [1] Geometry of Non-overflow section

[1] GENERAL CONDITION OF NON-OVERFLOW SECTION

- [2] Settlement
- [2] Joints
- [1] Undermining
- [2] Downstream Slope
- [2] Cracks
- [C] Surface of Concrete
- [2] Settlement of Embankment
- [1] Upstream Slope
- [1] Deflections
- [1] Leakage
- [1] Crest of Dam
- [1] Toe of Slope

[1] GENERAL CONDITION OF SPILLWAY AND OUTLET WORKS

- [2] Auxiliary Spillway
- [2] Joints
- [2] Mechanical Equipment
- [2] Service or Concrete Spillway
- [2] Surface of Concrete
- [F] Plunge Pool
- [2] Stilling Basin
- [2] Spillway Toe
- [2] Drain

- [1] Maintenance
- [3] Evaluation
- [B] Hazard Class
- [-4] Inspector

COMMENTS:

DRAIN OPEN AT INSPECTION

(By Visual Inspection)

LEBANON RESERVOIR Also called KINGSLEY BROOK RES.

Dam Number	River Basin	Town	County	Hazard Class	Date & Inspector
698	SUS	LEBANON	MADISON	B	11-2-77 G.K. & DOT

Stream = KINGSLEY BROOK Owner = DOT CANALS - UTICA Scuba R.W. & Roland Lab (Regio

Type of Construction

- ☐ Earth w/Concrete Spillway
- ☐ Earth w/Drop Inlet Pipe
- ☑ Earth w/Stone ~~or Riprap~~ Spillway
- ☐ Concrete
- ☐ Stone
- ☐ Timber
- ☐ Other _____

Use

- ☑ Water Supply
- ☐ Power
- ☑ Recreation - ☐ High Density
- ☐ Fish and Wildlife
- ☐ Farm Pond
- ☐ No Apparent Use-Abandoned
- ☑ Flood Control (MINOR)
- ☐ Other _____

Estimated Impoundment Size 300 Acres ## Estimated Height of Dam above Streambed 60 Ft.

Condition of Spillway NO AUXILIARY

- ☑ Service satisfactory
- ☐ In need of repair or maintenance
- ☐ Auxiliary satisfactory
- ☐ In need of repair or maintenance

Explain: _____

Condition of Non-Overflow Section

- ☐ Satisfactory
- ☑ In need of repair or maintenance

Explain: Seepage Areas at interface of existing ground and earth embankment (See Remarks)

Condition of Mechanical Equipment

- ☑ Satisfactory
- ☐ In need of repair or maintenance

Explain: Dam operates O.K. - Water surface was being lowered for winter level

Siltation ☐ High ☑ Low

Explain: _____

Remarks: Large areas that are wet and boggy along downstream face on ~~right~~ left side. On lower right side a small slough out has occured with seepage problem - DOT (UTICA) will let contract in 1978 for dam with a pipe to correct seepage problem

Evaluation (From Visual Inspection)

- ☑ Repairs req'd. beyond normal maint.
- ☐ No defects observed beyond normal maint.

DOT. UTICA WILL LET CONTRACT FOR REPAIRS IN 1978

March 14, 1978

#613 Susq.

KINGSLEY BROOK (LEBANON) RESERVOIR DAM INSPECTION REPORT
PIN E104.05.701.03 MADISON COUNTY

BERNARD E. BUTLER

Lyndon H. Moore, Soil Mechanics Bureau, Rm. 102, Bldg. 7
By: Bernard E. Butler
J. R. Stellato, Waterways Maint. Subdiv., Rm. 216, Bldg. 5

cc R. Simberg, Regional Director, Region 2
G. Koch, ENCON, 50 Wolf Rd.

This Bureau has completed our inspection and evaluation of the Kingsley Brook Reservoir Dam. This review was done as part of our program of evaluating the condition of all canal feeder dams in Region 2.

Our report is based on the plan and cross-sections of this structure prepared by the Regional Soils Section, analysis and laboratory testing of soil samples from nine test pits, and several field inspections by members of this Bureau accompanied by representatives of the Regional Soils and Waterways sections.

As stated in our memo to the Region dated November 7, 1977, there are several wet areas on the downstream face of the embankment. We noted an increase in the quantity of water coming out of the embankment between our inspections (Nov. 1976 and Nov. 1977). This increased flow should be considered as a signal of potential danger. It is our understanding that to reduce the hazard of this structure, the spillway gates were opened in December, 1977 and the water level has dropped significantly. We concur with this action and recommend that the lower water level be maintained until corrective work is completed on the downstream slope.

In addition to the wet areas on the embankment, there is an area of continuing sloughing at the northern end of the structure. This sloughing appears to be beyond the toe of the embankment and in the natural soil. The cause of the sloughing is not readily apparent, since the natural slopes appear to be relatively flat. Water is definitely a factor in the movement of the soil. Some treatment will be needed to remove the water and prevent further movement in this area.

We recommend that the seepage be controlled as it emerges on the downstream face by using a surface type graded filter. This would be similar to the treatment that we recommended for Eaton Brook dam

The filter material nearest to the embankment should be one of the types of filter fabric which is acceptable for undercut applications. A specification for filter fabric was supplied to you for Eaton Brook.

The filter fabric should be covered with a layer of stone approximately 2 feet thick. The material used should be an equal part mixture of stone meeting the requirements of size designations 1, 2 and 3A. This mixture was used for the work which was recently performed at Hinckley dam.

The recommended limits of the filter will be shown on a drawing which will be transmitted at a later date. The filter should extend along most of the downstream toe of the embankment. While this includes more than the existing wet areas, as outlined by the survey done in December 1977 by the Regional Soils personnel, we feel that the proposed limits are required due to the relatively steep slopes of the embankment in certain areas and the seepage potential through the embankment soils. Some extension up the slope may be required depending on the upper boundary of the wet areas at the time of construction.

In addition, we have extended the filter beyond the toe of the slope to include major portions of both Wet Area no. 1 and Wet Area no. 2. Included in Wet Area no. 1 is the area of sloughing which was previously mentioned. The exact location of this area was not clearly defined on the plan or the cross sections which we received. Therefore the limits shown for the filter in this area are approximate. The filter should extend from slightly above the area of movement down the slope to the flat portion of the wet area. The final limits should be determined by the Regional Soils Engineer in the field at the time of construction.

Since there is evidence of movement in this area, we feel that any stripping or slope flattening before placing the filter might cause additional movement. Therefore, we recommend placing the filter fabric directly on the existing slope, then covering it with the stone. Enough stone should be placed to flatten the slope in this area to a 1 on 2.

On the southern end of the dam, Wet Area no. 2 extends beyond the toe of the embankment. While this is not actually part of the embankment, the filter should be extended into this area to assure that the water is safely removed from this slope.

Six inch perforated underdrain pipes should be included in the coarse portion of the drains. These pipes should be located to intercept the water in the drain and carry it to the center spillway channel. The approximate locations of these pipes will be shown on our forthcoming drawing. The final locations of the drain pipes will have to be determined by the Engineer at the time of construction.

A large portion of each of the wet areas is in the flat portion beyond the toe of the embankment. Provisions should be made to drain these large swampy areas. Simply providing ditches to carry the water away from the area and into the outlet channel should satisfactorily drain these areas.

We have two additional minor recommendations concerning this structure. First, the brush and trees on the embankment should be cut down. Second, the local farmer whose cows graze on the dam embankment should be told to find a new pasture.

This concludes our inspection report and recommendations for correcting the defects which exist on this structure. It is our opinion that until some repair work is scheduled, that the reservoir should not be allowed to fill to its normal level. We will be pleased to provide more assistance in implementing any of our recommendations including the determination of the final limits of the filter required at the time of construction.

RLW:MVM

DATE March 7, 1980

MEMORANDUM
DEPARTMENT OF TRANSPORTATION

SUBJECT PIN ML 7000.701.11, MANAGEMENT BY OBJECTIVES
INSPECTION OF WATER IMPOUNDMENT STRUCTURES
LEBANON (KINGSLEY BROOK) RESERVOIR DAM, REGION 2

FROM J. J. Murphy, Materials Bureau, Rm. 210, Bldg. 7A

TO J. R. Stellato, Waterways Maintenance Subdiv., Rm. 216, Bldg. 5
CC: F. Jennings, Waterways Maintenance Engineer, Region 2

On September 7, 1979, an inspection was made by Mr. Sam Candib. Earlier in the year, the reservoir had been drained due to seepage areas noted on the downstream side of the earth embankment and the intake structure was now exposed.

The present embankment is about 800 feet long, 45 feet high and it has a paved road across the top. The T shaped reservoir is about 2000 feet long and 1000 feet wide on the leg behind the embankment and 3000 feet long and 600-800 feet wide across the top of the T. There was also a New York State Department of Environmental Conservation hand launch site for small boats at the southwest end of the reservoir and a private campground with 175 sites along the north shore.

LOOKING EAST FROM WEST END OF RESERVOIR
Campground is located at left and launch site is at far right out of picture.

Located in southern Madison County west of Hamilton, this earth embankment dam created one of seven reservoirs built between 1834 and 1836 to feed the summit level of the Chenango Canal north of Hamilton.

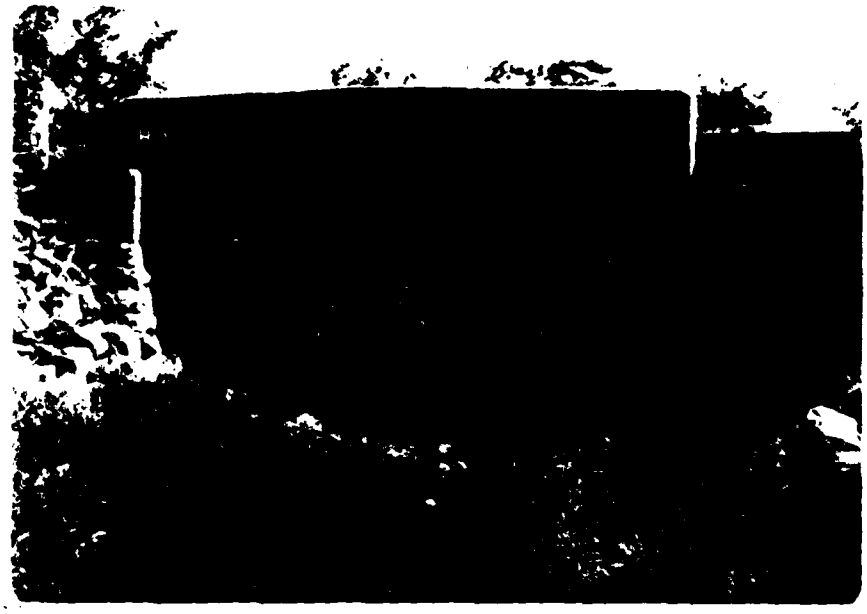
In April 1843, the dam was badly damaged by a flood. Since the canal commissioners believed this water source was unnecessary, it was not repaired at this time. By 1862, additional water was needed for the Chenango Canal and in 1864 reconstruction of Kingsley Brook Reservoir was begun.

Through a scarcity of labor and a change in plans, reconstruction wasn't completed until 1867. The dam was originally designed to be twice as high as it was built in 1835 or 14 feet higher than its constructed flow line. When reconstruction began, plans called for repairs only to the breaches, but later it was deemed economical to raise the dam to its designed height. For a small increase in cost, the reservoir capacity was doubled.

Under Chapter 404, Laws of 1877, the Chenango Canal was abandoned, but the reservoir system and feeder canals were retained to feed the enlarged Erie Canal. Reservoir water flowed north through a five mile section of the old Chenango Canal and then dropped into Oriskany Creek at Solsville where it naturally flowed north to the Erie Canal or Mohawk River near Utica.

Due to a breach in one of the feeder canals, water from Lebanon or Kingsley Brook Reservoir, its original name, no longer flows north. Instead it flows into the Chenango River and south to the Susquehanna River.

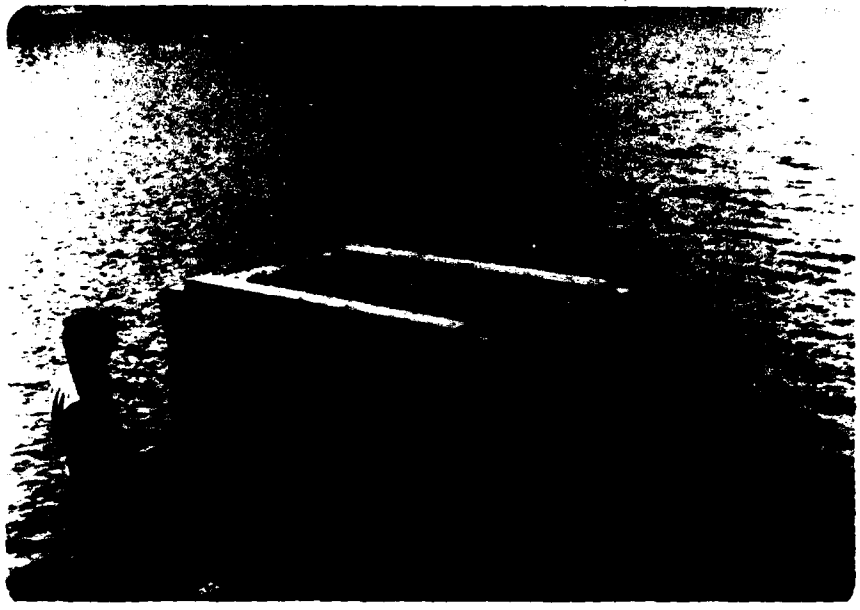
LOOKING NORTH FROM SPILLWAY
Campground and beach are located on hillside.



UPPER SPILLWAY AREA

At the south end of the embankment was the spillway with the jack-arch roadway bridge overhead. The stone masonry spillway was about 20 feet wide, 10 feet high and it appeared in generally good condition. Shotcrete that was applied in 1930 has nearly all fallen off.

LOWER SPILLWAY AREA

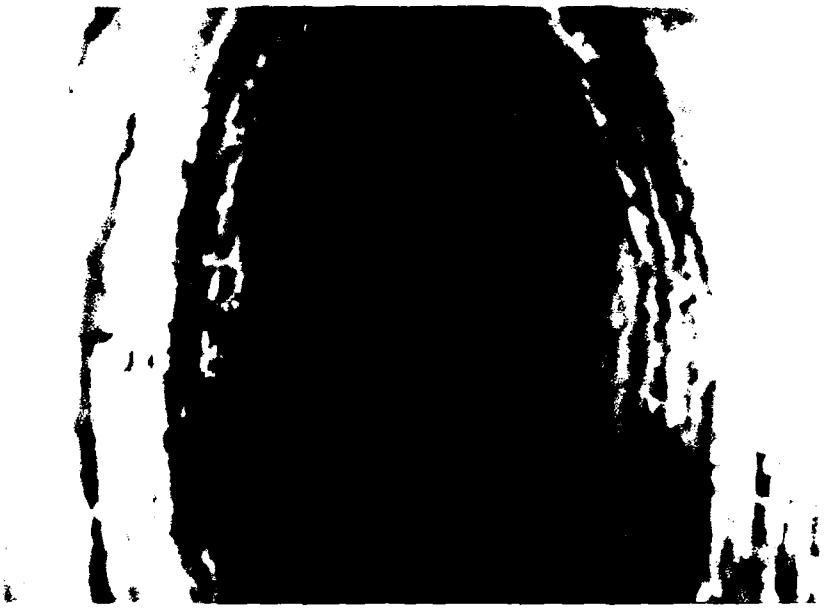


WOOD INTAKE STRUCTURE

The intake structure was built with planks and it had slotted openings on 4 of the 5 exposed faces. It must rest on stone masonry at the entrance to the culvert which leads under the embankment to the intake pipes. A few new planks indicated recent repairs.

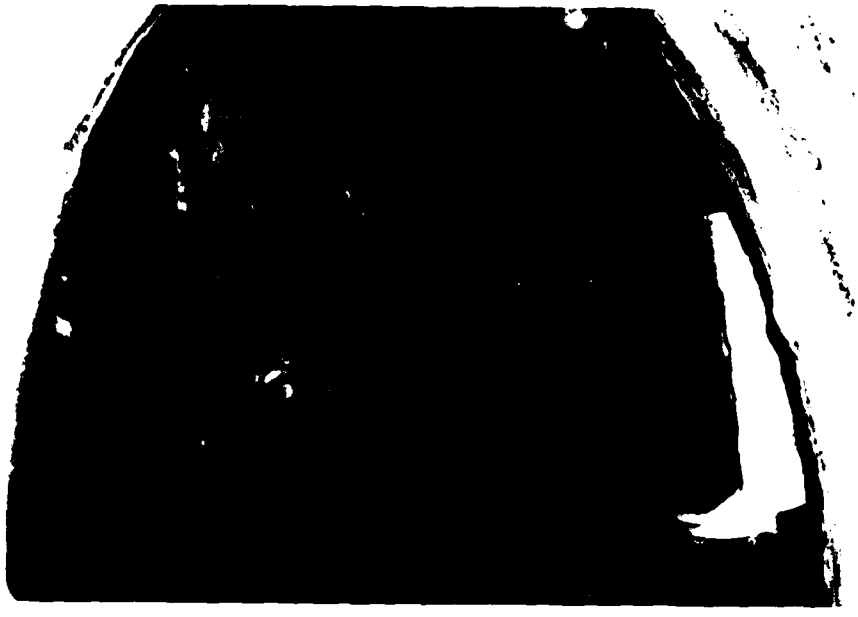
GATED CULVERT ENTRANCE AREA

The stone masonry headwall at the exit end of the drain culvert was also in good condition. Shotcrete applied to this area in 1930 has also nearly all fallen off.



LOOKING OUT CULVERT FROM WELL

The 8 foot high by 4 foot wide, oval shaped, stone masonry culvert leads some 200 feet in under the embankment. Walkway planks were supported about 2 feet above the culvert bottom by transverse iron bars. Over the years, water has been slowly leaking into the culvert and mineral deposits have formed on the inside walls as the water evaporated. The mineral deposits started about 50 feet into the culvert and were generally 1 inch or so in thickness and up to 2 inches in a few locations deep under the embankment. Except for this slow mineral formation and occasional drips, the culvert appeared in good condition.



VALVES IN DOMED WELL

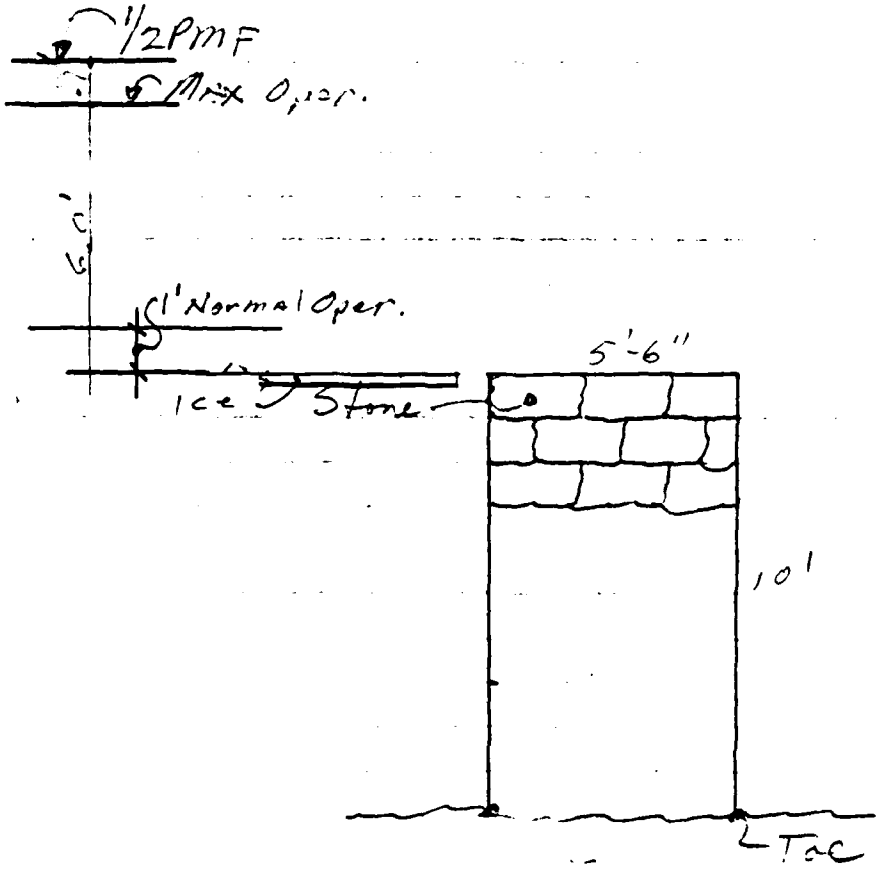
At the far end of the culvert was located a 9 foot diameter, domed well. This well contained four 8 inch valves that control the flow out of the reservoir. The water drops into a plunge pool under the plank floor and runs out under the walkway. There were some mineral deposits on the wall of the well, but it also looked in good condition.

No repairs appeared to be needed at this time to the spillway or culvert. However, under Contract D95846 in October of 1978, a filter fabric was installed to control seepage on the downstream slope of the embankment.

JJM:SJC:DMC
FILE: 17.1-2-2

APPENDIX E

STRUCTURAL STABILITY ANALYSIS



Sect. wt. Mom.

$5.5 \times 10 \times .1 =$ 5.5 $\times \frac{5.5}{2}$ 15.13'K

$F_{H\,NORM} = 10 \times .0624 \times \frac{10}{2} = 3.12^K$ $\times \frac{10}{3} = 10.4'K$

$+ .0624 \times 10^2 \times .624^{K/F} = 3.744^K$ $\times 10/2 = 13.52'K$

$F_{H\,ice} = 5^K$ $M_{O.T.\,ice} = 5 \times 10' =$

$F_{H\,MAX.} = \frac{16^2}{2} \times .0624 = 8^K$ $\times \frac{16}{3} = 42.6'K$

$F_{H\,1/2\,PMF} = \frac{16.9^2}{2} \times .0624 = 9.9$ $\times \frac{16.9}{3} =$

$Uplift = .0624 \times 1.1 = .624 \times 2/3 \times \frac{5.5}{2} = 1.15^K$

$M_{O.T.} = 1.15 \times \frac{5.5}{2} =$

$= 3.17'K$

Stability Comps

Loading Case: Normal

$F_H = 3.744^K$ $\quad M_{OT} = 13,52^{1K}$

$F.S._{O.T.} = \frac{15.13}{(3.52+3.67)} = 0.88$ Unstable

$F.S._{SL.} = \frac{5.5-1.15}{3.744} = 1.16$ Undesirable

Loc. of Res. $\frac{15.13-17.19}{(5.5-1.15)} = -.474 \div 5.5 = -.096$ *

Loading Case: Normal + Ice

$F_H = 3.74 + 5 = 8.74^K$ $\quad M_{OT} = 67.19^{1K}$

$F.S._{OT} = \frac{15.13}{67.19} = 0.23$ Unstable

$F.S._{SL} = \frac{5.5-1.15}{8.74+5} = 0.32$ Unstable

Loc. of Res. $\frac{15.13-67.19}{(5.5-1.15)} = *-11.97'$

Loading Case: Max. Oper.

$F_N = 3^K$ $\quad M_{OT} = 42.6^{1K}$

$F.S._{O.T.} = \frac{15.13}{(42.6+3.67)} = 0.33$ Unstable

$F.S._{SL.} = \frac{5.5-1.15}{8} = .544$ Unstable

Loc of Res: $\frac{15.13-46.27}{(5.5-1.15)} = -7.16$ *

PROJECT [illegible]

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN. 06510/203/789-1260

SHEET NO. 5 OF 5
BY KW DATE 8/25
CHK'D. BY _____ DATE _____

Loading Case: ½PMF Water @ Spillway

$F_H = 53.7$ $M_{O.T.} = 50.2 \times 3.67 = 54$

$F.S._{O.T.} = \frac{15.13}{54} = 0.28$ Unstable

$F.S._{SL.} = \frac{5.5 - 1.15}{8.9} = 0.49$ Unstable

$Req./Loc. \quad \frac{15.13 - 54}{(5.5 - 1.15)} = -8.94'$ *

APPENDIX F

REFERENCES

REFERENCES

1. Chow, Ven Te, Editor - Handbook of Applied Hydrology. McGraw-Hill Book Company, New York, New York, 1964.

2. Hydrologic Engineering Center, U.S. Army Corps of Engineers, HEC-1 Flood Hydrograph Package, Users Manual. Davis, California, January 1973.

3. Hydrologic Engineering Center, U.S. Army Corps of Engineers, Flood Hydrograph Package (HEC-1), Users Manual for Dam Safety Investigations, Davis, California, September 1978.

4. King, Horace and Brater, Ernest. Handbook of Hydraulics, 5th Edition. McGraw-Hill Book Company, New York, New York, 1963.

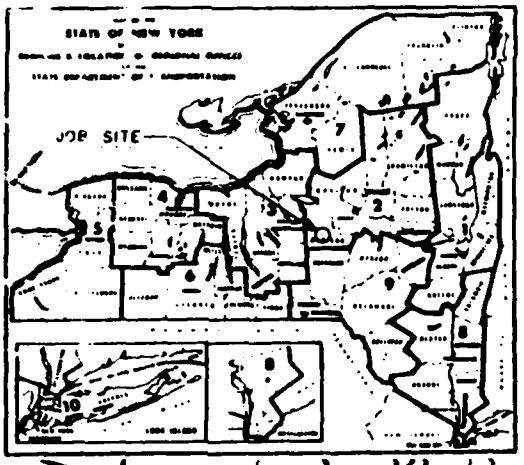
5. Riedel, J.T., Appleby, J.F. and Schloemer, R.W. Seasonal Variation of the Probable Maximum Precipitation East of the 105th Meridian for Areas from 10 to 1000 Square Miles and Durations of 6, 12, 24, and 48 Hours (Hydrometeorological Report No. 33) U.S. Department of Commerce - Weather Bureau and U.S. Department of the Army - Corps of Engineers, Washington, D.C., April 1956

6. U.S. Department of the Interior, Bureau of Reclamation, Design of Small Dams, Second Edition, Washington, D.C., 1973.

APPENDIX G

DRAWINGS

D95840



STATE OF NEW
DEPARTMENT OF TRA
DESIGN AND CONSTRUC

CHAPTER 542 LAWS O

CONTRACT D
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FOR CORRECTIVE
EATON BROOK RESERVOIR
AND
KINGSLEY BROOK RESERVOIR
MADISON COU
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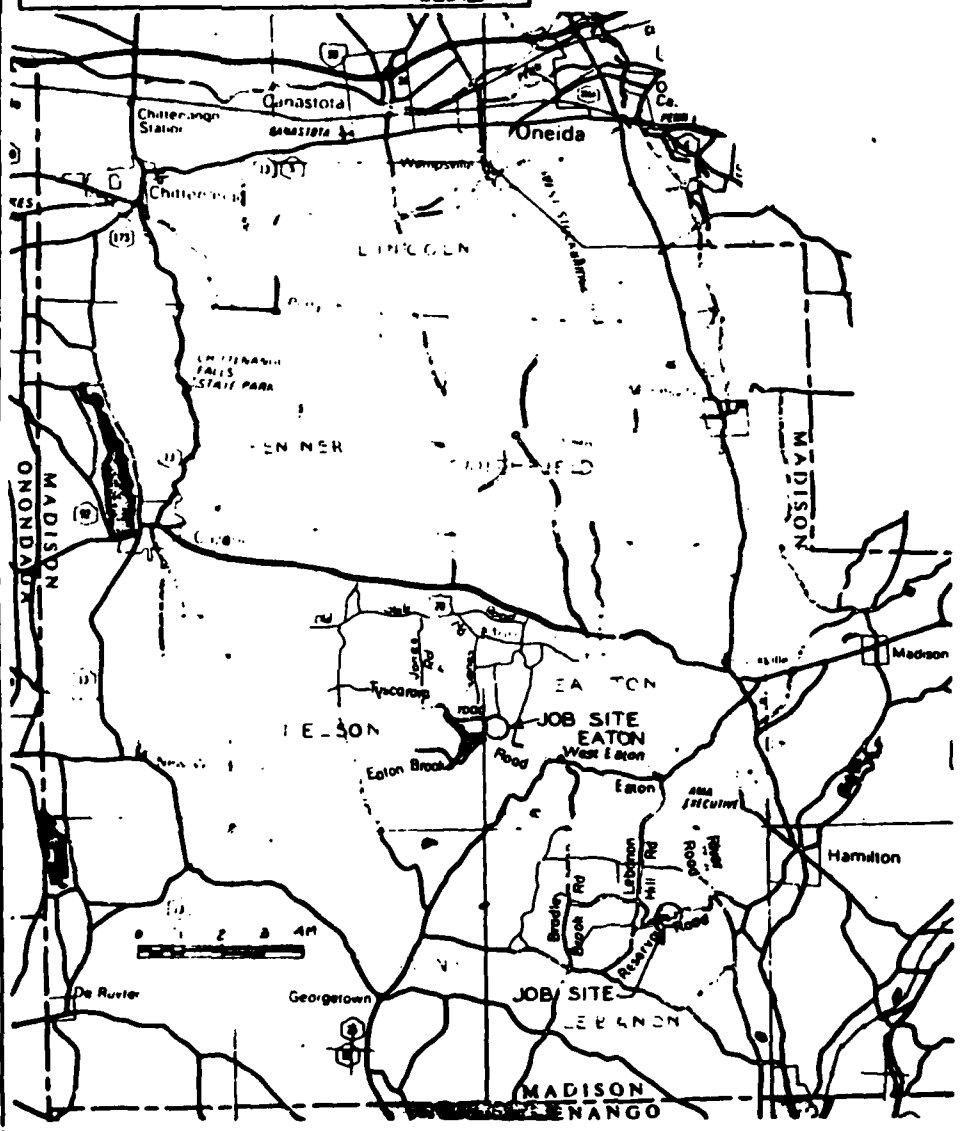
INDEX	
SHEET NO	DESCRIPTION
1	TITLE SHEET, INDEX & T
2	PLAN VIEW & DETAILS
3	TYPICAL SECTIONS - EATO
4	PLAN VIEW & DETAILS OF
5 & 6	TYPICAL SECTIONS - KINGS



RECOMMENDED BY
REGIONAL CONSTRUCTION ENGINEER — DATE 4/21/98

RECOMMENDED BY
REGIONAL WATERWAYS MAINT ENGINEER — DATE 4/21/98

PREPARED PURSUANT TO THE CANAL LAW
AND RECOMMENDED BY
REGIONAL DIRECTOR — DATE 4/21/98

D95846

D95846

	STATE		SHEET NO	TOTAL SHEETS
1	N.Y.		1	6
CORRECTIVE WORK AT EATON & KINGSLEY BROOK DAMS				

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
AND CONSTRUCTION DIVISION

CHAPTER 542 LAWS OF 1938

CONTRACT D95846
FINAL REFERENCE NO. M78-1)
FOR CORRECTIVE WORK AT
EATON BROOK RESERVOIR, TOWN OF EATON
AND
KINGSLEY BROOK RESERVOIR, TOWN OF LEBANON
MADISON COUNTY
SHEETS 1 THRU 6
SCALES AS INDICATED

TYPE OF CONSTRUCTION

Clearing and Grubbing Placing Filter Membrane and Blanket of Crushed Stone on Wet Areas at Reservoir Dams

All work contemplated under this contract is to be covered by and in conformity with the specifications of January 3, 1978 except as modified on these plans and in the Itemized Proposal

CAPITAL PROJECT IDENTIFICATION NUMBER 2040 63 301

NOTE
PHOTOGRAPHIC REPRODUCTIONS
These plans are not to scale.
All scales are reduced from indicated to approximately half size.

INDEX

TABLE OF QUANTITIES

ITEM NO	DESCRIPTION	UNIT	QUANTITY
201.0101	CLEARING AND GRUBBING	L.S	NEC
122030201	UNCLASSIFIED EXCAVATION AND DISPOSAL (FROM ZERO TO 800 CUBIC YARDS INCL.)	C.Y	800
12203.0202	UNCLASSIFIED EXCAVATION AND DISPOSAL (FROM 801 TO 2400 CUBIC YARDS INCL.)	C.Y	1600
12203 0203	UNCLASSIFIED EXCAVATION AND DISPOSAL (GREATER THEN 2400 CUBIC YARDS)	C.Y.	1200
17203 98	PLASTIC FILTER FABRIC	S.Y	16600
12605.0702	STEEL PIPE UNDERDRAIN, PERF., CORR., 6" DIA	L.F	1400
619 01	BASIC MAINTENANCE AND PROTECTION OF TRAFFIC	L.S	NEC.
619.02	CONSTRUCTION SIGNS	L.S	NEC.
619 12	WATCHMAN SERVICE, REQ. 'C'	PATROL	250
623 03	CRUSHED STONE (BY WEIGHT)	TON	14500
637 06	ENGINEERS OFFICE - TYPE B	MONTH	4
699.01	MOBILIZATION	L.S	NEC.

4/21/78
DATE

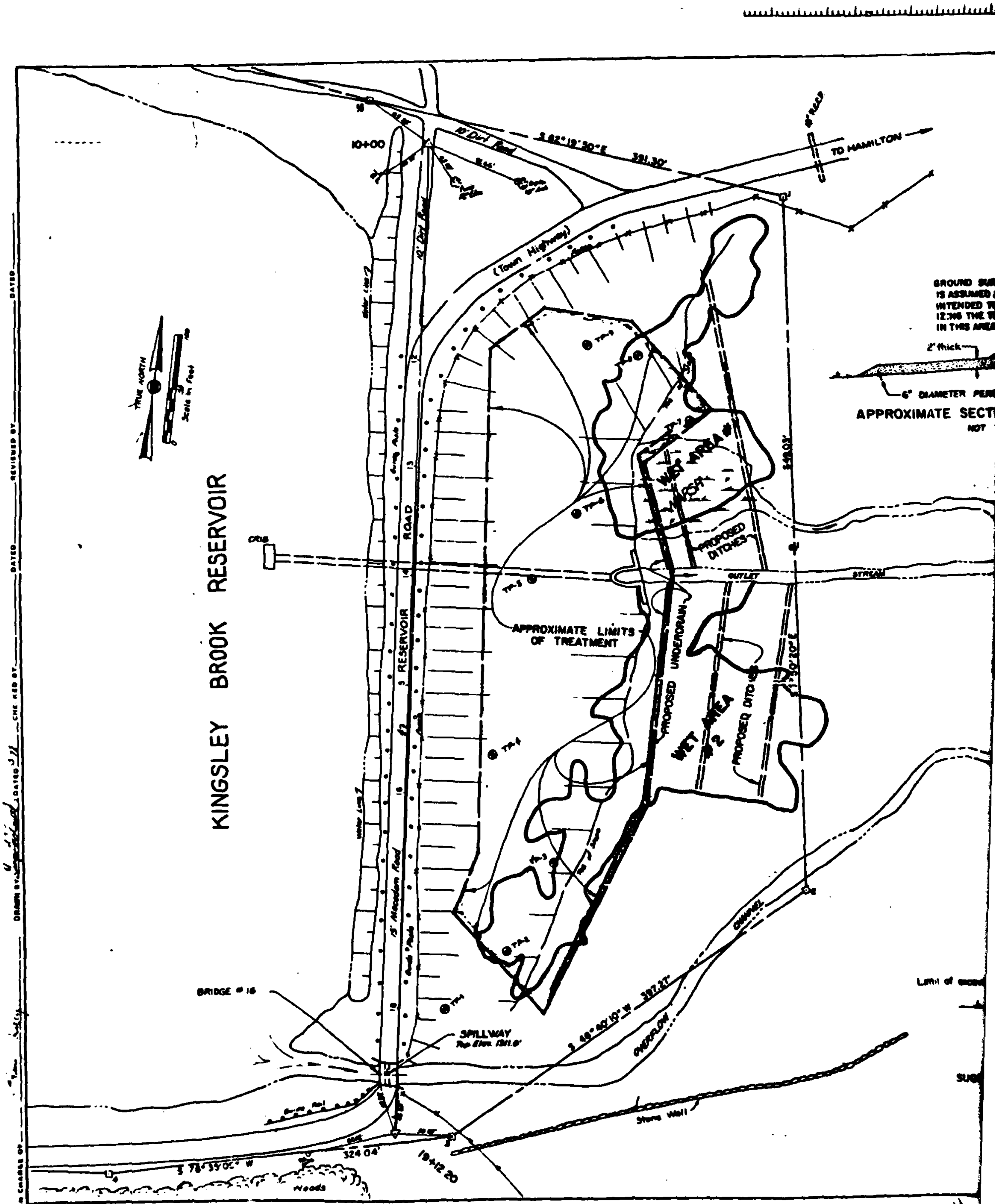
APPROVED Joseph R Stellato 4/28/78
JOSEPH R STELLATO DIRECTOR WATERWAYS MAINT

TITLE SHEET

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION

DRAWING No.	SCALE	DATE	REGION
	As Shown	4/78	2

D95846


KINGSLEY BROOK RESERVOIR
RESERVOIR ROAD
TO HAMILTON
10' Dirt Road
12' Dirt Road
(Town Highway)
S 82°19'30"E
391.30'
10+00
19+12.20
TRUE NORTH
Scale in Feet
CRIB
OUTLET
STREAM
PROPOSED DITCHES
PROPOSED UNDERDRAIN
WET AREA #1
MARSH
WET AREA #2
APPROXIMATE LIMITS OF TREATMENT
BRIDGE #16
SPILLWAY
S 48°40'10" W
397.27'
OVERFLOW
CHANNEL
Stone Wall
Woods
324.04'
15' Macadam Road
Water Line
APPROXIMATE SECT
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2" thick
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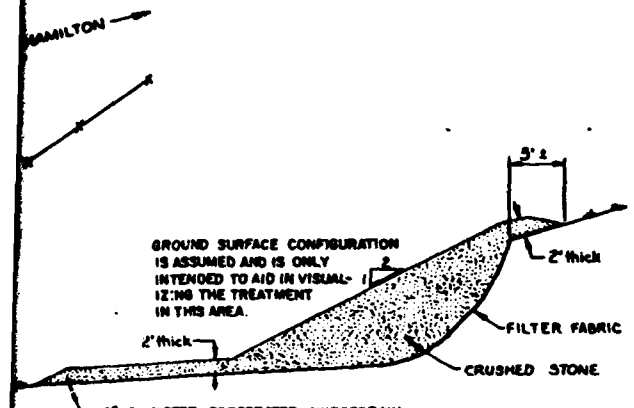
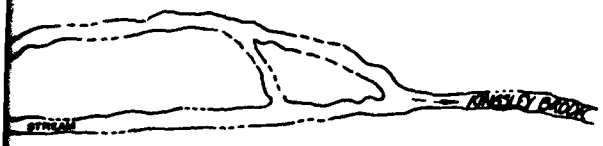
D95846

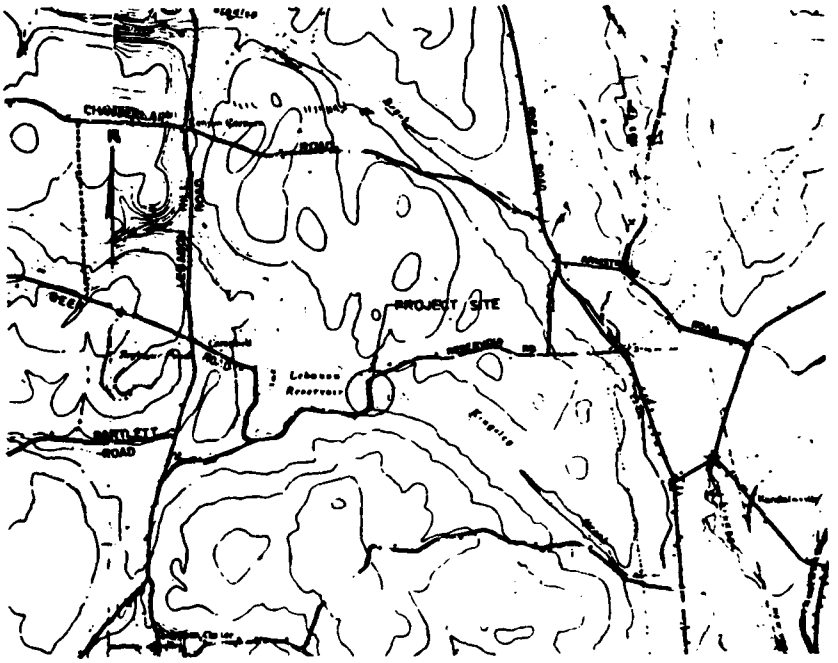
FED. ROAD REG. NO.	STATE	FEDERAL AID PROJECT NO.	SHEET NO.	TOTAL SHEETS
1	N.Y.		4	6

KINGSLEY BROOK RESERVOIR
MADISON COUNTY



APPROXIMATE SECTION THRU TP-7 AND TP-8
NOT TO SCALE





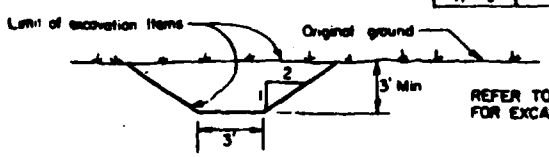
PROJECT LOCATION MAP
SCALE: 1" = 2,000'

NOTES:

1. Limits shown for filter treatment and the locations of the underdrain pipe and drainage ditches are approximations only. The actual limits and locations will be determined during construction by the Regional Soils Engineer or his representative.
2. Refer to the Special Notes in the Proposal as to the requirements for topsoil stripping and progress of work.
3. Locations of the test pits are approximate. Refer to the table below for test pit soil analyses.

LABORATORY GRAIN SIZE DISTRIBUTION TEST SUMMARY

DRILL HOLE NO	REPRESENTATIVE SAMPLE Depth in Feet	% PASSING BY WEIGHT U.S. STANDARD SIEVE NUMBER											HYDROMETER ANALYSIS	
		3"	2"	1"	1/2"	1/4"	#4	#10	#20	#40	#60	#100	#200	.02mm	.005mm
TP-1	0 - 2.0	100	91.5	77.0	68.4	60.5	57.7	50.6	45.3	42.7	41.2	39.8	38.3	20.7	6.4
"	2.0 - 4.0	100	95.1	83.0	73.0	65.2	60.9	53.8	48.6	46.0	44.4	43.1	41.5	25.1	11.0
TP-2	0 - 2.0	100	97.9	92.3	86.7	80.0	76.5	70.4	65.4	62.8	61.0	59.2	56.7	31.1	9.9
TP-4	0 - 2.0	100	90.2	76.1	62.7	56.2	53.6	48.6	44.5	41.2	38.7	34.7	30.3	12.9	3.9
TP-6	0 - 2.0	89.4	83.4	70.8	59.0	53.7	51.8	47.6	43.6	40.6	37.8	34.9	30.9	15.1	4.5
TP-7	0 - 2.0	100	96.8	87.7	82.0	75.3	73.5	70.6	68.1	65.9	63.3	60.2	55.3	27.7	7.8
TP-8	0 - 2.0	100	98.3	90.6	85.6	78.9	51.4	45.0	39.8	37.0	34.5	32.2	29.0	11.8	2.9
TP-9	0 - 2.0	100	89.3	75.9	67.7	61.9	58.8	53.5	49.1	46.0	43.3	40.3	35.7	16.3	4.4



SUGGESTED TYPICAL SECTION FOR DRAINAGE DITCHES
NO SCALE

REFER TO NOTE ON SHEET NO 6 FOR EXCAVATION PAYMENT

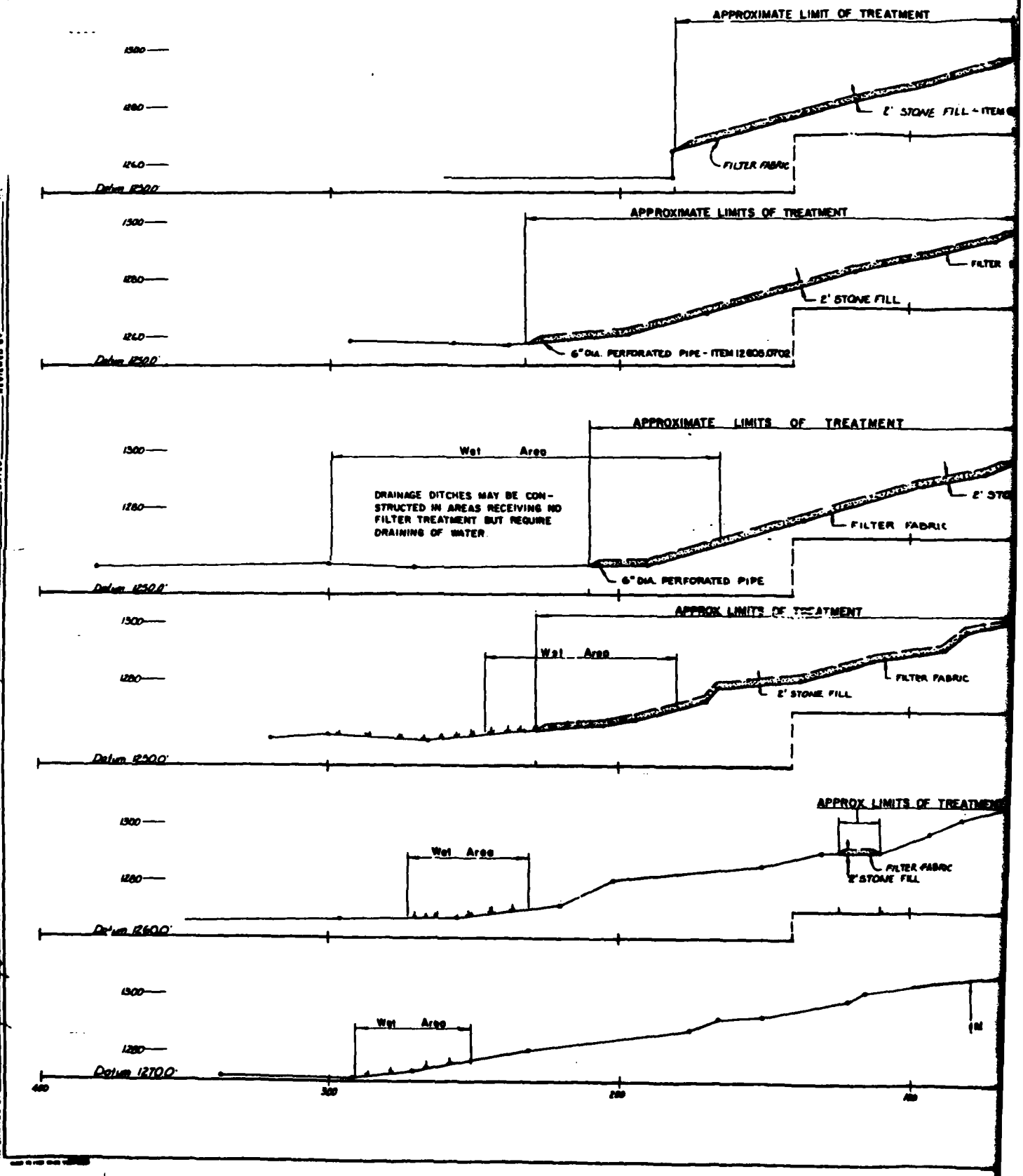
SYMBOLS

- CRUSHED STONE - #1, 2 & 3 Aggregate stone of approx equal amounts
- FILTER FABRIC
- DH DRILL HOLES
- TP TEST PITS

LEBANON RESERVOIR PLAN

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION

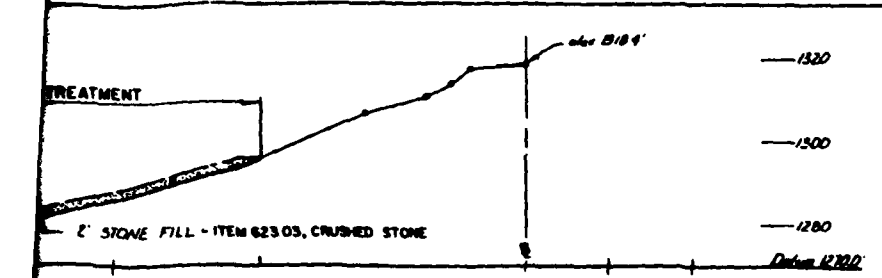
DRAWING No.	SCALE	DATE	REGION
H 8P-1	AS SHOWN	3 '74	REGION 2


APPROXIMATE LIMIT OF TREATMENT
1300
1280
1260
Datum 1250.0'
2' STONE FILL - ITEM
FILTER FABRIC
APPROXIMATE LIMITS OF TREATMENT
1300
1280
1260
Datum 1250.0'
FILTER
2' STONE FILL
6" DIA. PERFORATED PIPE - ITEM 12606.0702
APPROXIMATE LIMITS OF TREATMENT
1300
1280
Datum 1250.0'
Wet Area
DRAINAGE DITCHES MAY BE CONSTRUCTED IN AREAS RECEIVING NO FILTER TREATMENT BUT REQUIRE DRAINING OF WATER.
2' STO
FILTER FABRIC
6" DIA. PERFORATED PIPE
APPROX LIMITS OF TREATMENT
1300
1280
Datum 1250.0'
Wet Area
FILTER FABRIC
2' STONE FILL
APPROX LIMITS OF TREATMENT
1300
1280
Datum 1260.0'
Wet Area
FILTER FABRIC
2' STONE FILL
1300
1280
Datum 1270.0'
Wet Area
400
300
200
100

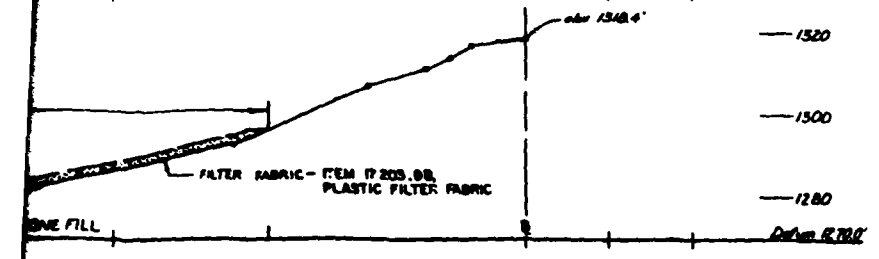
D85846

FED. ROAD REG. NO.	STATE	FEDERAL AID PROJECT NO	SHEET NO	TOTAL SHEETS
1	N.Y.		5	6

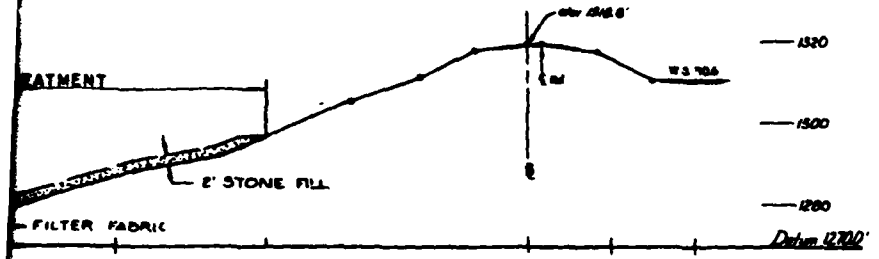
KINGSLEY BROOK RESERVOIR
MADISON COUNTY



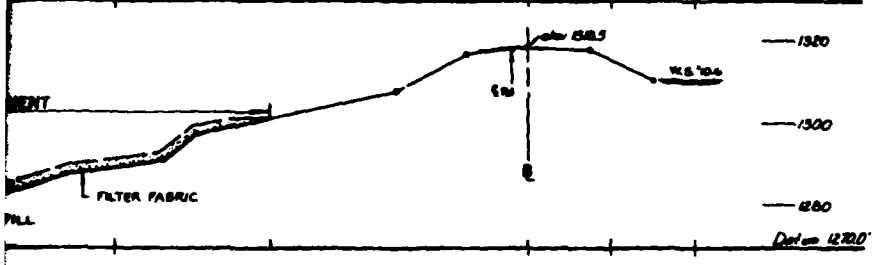
℄ STA. 13+92



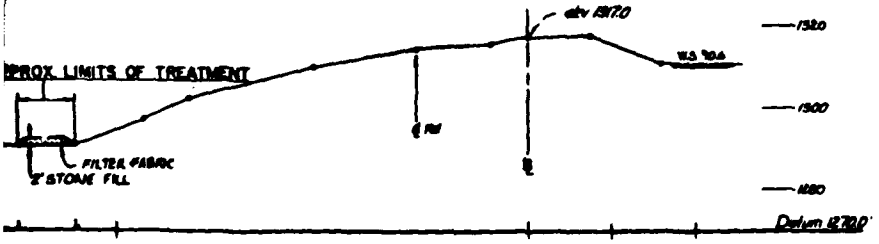
℄ STA. 13+74



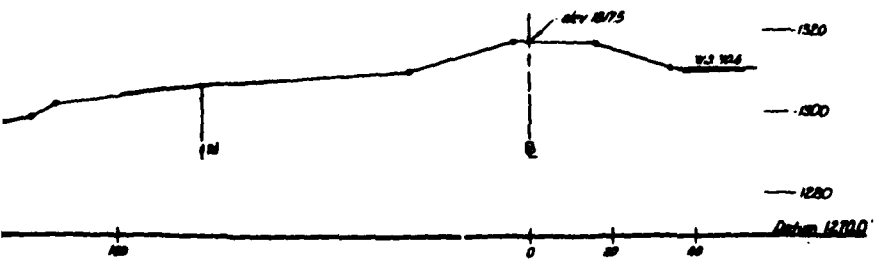
℄ STA. 13+00



℄ STA. 12+00



℄ STA. 11+50



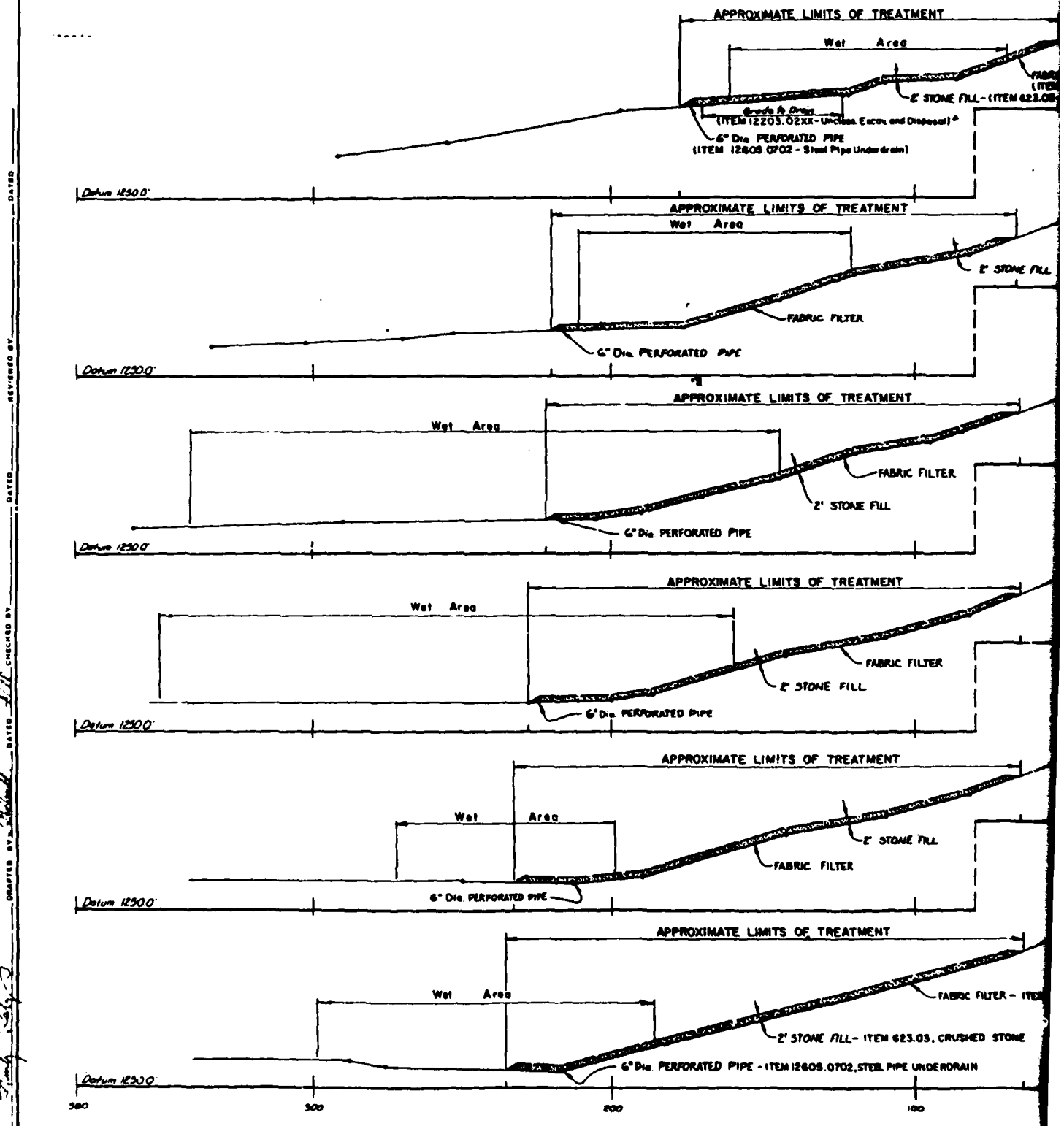
℄ STA. 11+06

SEE SPECIAL NOTES IN THE PROPOSAL REGARDING THE STRIPPING OF THE SURFACE UPON WHICH THE FILTER FABRIC IS TO BE PLACED.

20' CROSS SECTIONS

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION

DRAWING NO.	SCALE	DATE	REGION
KBX-1	HORIZ. 1"=40' VERT. 1"=20'	4-70	2

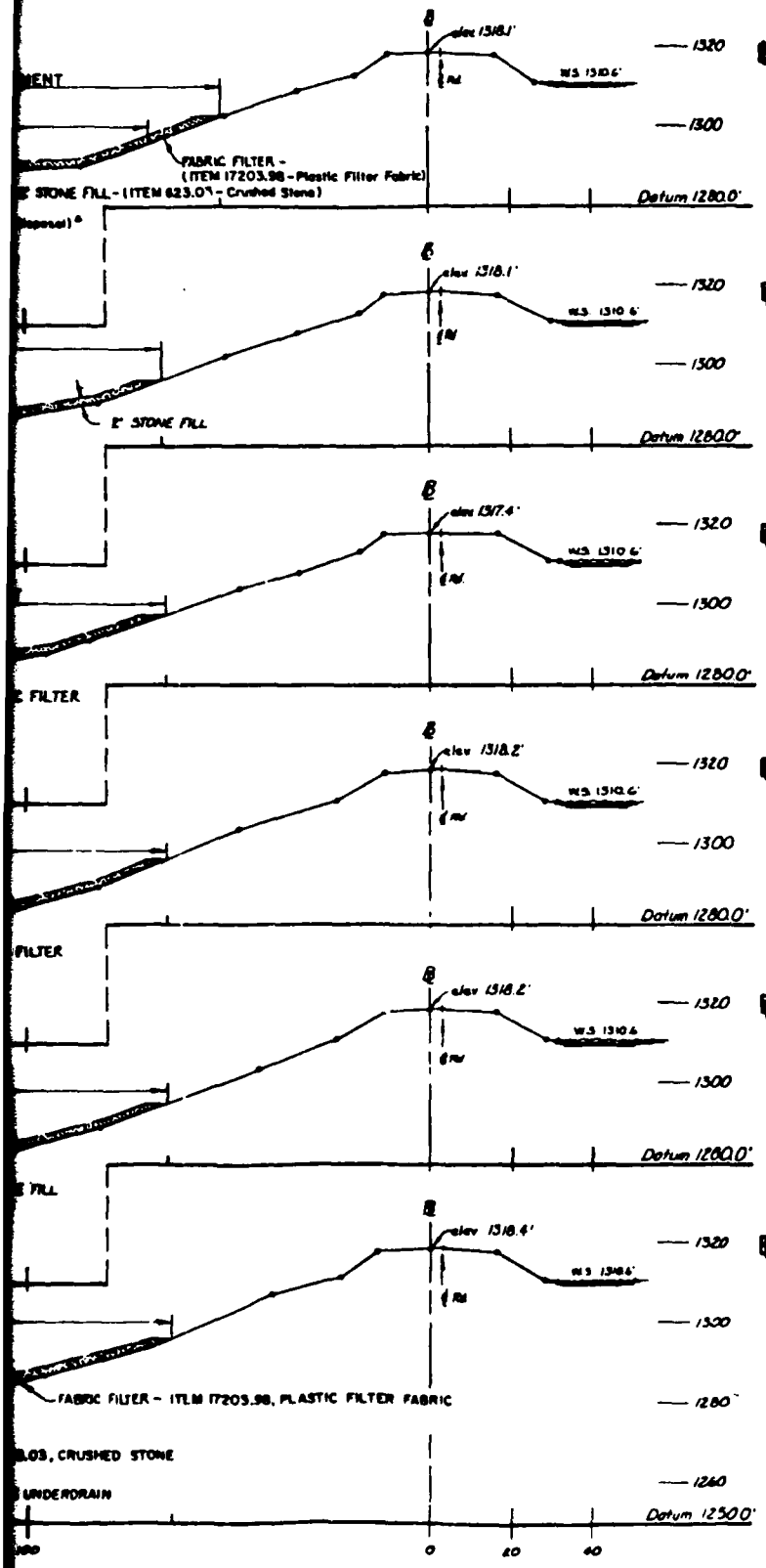


IN CHARGE OF _____ DRAFTED BY _____ DATED _____ CHECKED BY _____ DATED _____ REVIEWED BY _____ DATED _____

D95846

FED. ROAD REG. NO.	STATE	FEDERAL AID PROJECT NO.	SHEET NO.	TOTAL SHEETS
1	N.Y.		6	6

KINGSLEY BROOK RESERVOIR
MADISON COUNTY



* EXCAVATION WILL BE PAID FOR UNDER ONE OR MORE OF THE FOLLOWING ITEMS: 12203.0201, 12203.0202, 12203.0203. SEE SPECIAL NOTES IN THE PROPOSAL.

20' CROSS SECTIONS (CONT.)

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION

KBX-7		4/78	REGION 2

LOGS OF TEST PITS

REGION NO. 2
COUNTY Oswego

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU

SUBSURFACE EXPLORATION LOG

P.I.N. E104.05.706

PROJECT Lebanon Reservoir
TYPE OF EXPLORATION Test Pits

THE SUBSURFACE INFORMATION SHOWN HEREON WAS OBTAINED FOR STATE DESIGN AND ESTIMATE PURPOSES. IT IS MADE AVAILABLE TO BIDDERS ONLY THAT THEY MAY HAVE ACCESS TO IDENTICAL INFORMATION AVAILABLE TO THE STATE. IT IS PRESENTED IN GOOD FAITH, BUT IS NOT INTENDED AS A SUBSTITUTE FOR INVESTIGATIONS, INTERPRETATION OR JUDGEMENT OF THE BIDDER.

HOLE NO. TP1 / LINE & STA. OFFSET

SURF. ELEV. G.W. ELEV. None

DEPTH	SAMPLE NO.	(1)	(2)	FIELD DESCRIPTION
2'		LT Br	M	Sandy silt fine Gravel, Cobbles
4.5'		LT Br	M	Sandy silt Fine Gravel Cobbles
				Auger Refusal

BY H. Kimball DATE 4-11-77

HOLE NO. TP2 LINE & STA. OFFSET

SURF. ELEV. G.W. ELEV.

DEPTH	SAMPLE NO.	(1)	(2)	FIELD DESCRIPTION
2.5'		LT Br	M	Sandy silt Gravel
4.5'		LT Br	M	Sandy silt Fine Gravel Cobbles

BY H. Kimball DATE 4

(1) = PROFILE (2) = MOISTURE (W, M OR D)

REGION NO. ___ COUNTY ___	STATE OF NEW YORK DEPARTMENT OF TRANSPORTATION SOIL MECHANICS BUREAU **SUBSURFACE EXPLORATION LOG**	101 P.I.N. [illegible]

PROJECT [illegible]

TYPE OF EXPLORATION [illegible]

THE SUBSURFACE INFORMATION SHOWN HEREON WAS OBTAINED FOR STATE DESIGN AND ESTIMATE PURPOSES. IT IS MADE AVAILABLE TO BIDDERS ONLY THAT THEY MAY HAVE ACCESS TO IDENTICAL INFORMATION AVAILABLE TO THE STATE. IT IS PRESENTED IN GOOD FAITH, BUT IS NOT INTENDED AS A SUBSTITUTE FOR INVESTIGATIONS, INTERPRETATION OR JUDGEMENT OF THE BIDDER.

HOLE NO. T[illegible]3 LINE & STA. OFFSET

SURF. ELEV. G.W. ELEV. 2.5 Water [illegible]

DEPTH	SAMPLE NO.	(1)	(2)	FIELD DESCRIPTION
1.5'		[illegible]	[illegible]	[illegible] Fine Gravel / Cobbles
4.0'		Br	[illegible]	Sandy Silt, Gravel, Cobble. Refusal [illegible]

BY [illegible] DATE 4-11-[illegible]

HOLE NO. TP4 LINE & STA. OFFSET

SURF. ELEV. G.W. ELEV. 4.0

DEPTH	SAMPLE NO.	(1)	(2)	FIELD DESCRIPTION
4'		[illegible]	[illegible]	[illegible]
5.5'		Br	W	Cobble [illegible]

BY [illegible] DATE [illegible]

(1) = PROFILE (2) = MOISTURE (W, M OR D)

REGION NO. [illegible]
COUNTY [illegible]

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU

SUBSURFACE EXPLORATION LOG

P.I.N. [illegible]

PROJECT [illegible]
TYPE OF EXPLORATION Test Pits

THE SUBSURFACE INFORMATION SHOWN HEREON WAS OBTAINED FOR STATE DESIGN AND ESTIMATE PURPOSES. IT IS MADE AVAILABLE TO BIDDERS ONLY THAT THEY MAY HAVE ACCESS TO IDENTICAL INFORMATION AVAILABLE TO THE STATE. IT IS PRESENTED IN GOOD FAITH, BUT IS NOT INTENDED AS A SUBSTITUTE FOR INVESTIGATIONS, INTERPRETATION OR JUDGEMENT OF THE BIDDER.

HOLE NO. [illegible] LINE & STA. OFFSET
SURF. ELEV. G.W. ELEV. [illegible]

DEPTH	SAMPLE NO.	(1)	(2)	FIELD DESCRIPTION
4		Br	M	Sandy Silt, Sandy Gravel
4.5'				Cobble - Flat Rock, Refusal

BY H. [illegible] DATE 4 [illegible]

HOLE NO. TP6 LINE & STA. OFFSET
SURF. ELEV. G.W. ELEV. [illegible]

DEPTH	SAMPLE NO.	(1)	(2)	FIELD DESCRIPTION
2.5		Br	M	[illegible]
4.0'		Br	M	[illegible]

BY H. [illegible] DATE [illegible]

(1) = PROFILE (2) = MOISTURE (W, M OR D)

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU

SUBSURFACE EXPLORATION LOG

P.I.N. 2104.05 7013

REGION NO. 2
COUNTY Niagara

PROJECT Lewiston Reservoir
TYPE OF EXPLORATION Test Pits

THE SUBSURFACE INFORMATION SHOWN HEREON WAS OBTAINED FOR STATE DESIGN AND ESTIMATE PURPOSES. IT IS MADE AVAILABLE TO BIDDERS ONLY THAT THEY MAY HAVE ACCESS TO IDENTICAL INFORMATION AVAILABLE TO THE STATE. IT IS PRESENTED IN GOOD FAITH, BUT IS NOT INTENDED AS A SUBSTITUTE FOR INVESTIGATIONS, INTERPRETATION OR JUDGEMENT OF THE BIDDER.

HOLE NO. TP7 LINE & STA. OFFSET

SURF. ELEV. G.W. ELEV. 2.6'

DEPTH	SAMPLE NO.	(1)	(2)	FIELD DESCRIPTION
5.5'		Br	W	Sandy SILT, Fine Gravel, Possible Cobbles, Hole Filled in
				STOPPED HOLE @ 5.5'

BY H VS Nigil DATE 4-11-77

HOLE NO. TP8 LINE & STA. OFFSET

SURF. ELEV. G.W. ELEV. 1.5'

DEPTH	SAMPLE NO.	(1)	(2)	FIELD DESCRIPTION
				Roots, Silty Fine Sand, Fine Gravel, Cobbles
4.5'		Br	W	
				Auger Refusal @ 4.5'

BY H VS Nigil DATE 4-11-77

(1) = PROFILE (2) = MOISTURE (W, M OR D)

REGION NO. 2

COUNTY [illegible]

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU

SUBSURFACE EXPLORATION LOG

E114 05.701 03
P.I.N.

PROJECT Lebanon Reservoir

TYPE OF EXPLORATION Test Pits

THE SUBSURFACE INFORMATION SHOWN HEREON WAS OBTAINED FOR STATE DESIGN AND ESTIMATE PURPOSES. IT IS MADE AVAILABLE TO BIDDERS ONLY THAT THEY MAY HAVE ACCESS TO IDENTICAL INFORMATION AVAILABLE TO THE STATE. IT IS PRESENTED IN GOOD FAITH, BUT IS NOT INTENDED AS A SUBSTITUTE FOR INVESTIGATIONS, INTERPRETATION OR JUDGEMENT OF THE BIDDER.

HOLE NO. TP9 LINE & STA. OFFSET

SURF. ELEV. G.W. ELEV. 6.5'

DEPTH	SAMPLE NO.	(1)	(2)	FIELD DESCRIPTION
2.5		Br	M	Gravelly Silt
4.0'		Br	M	Fine Sand, Fine Gravel - Cobbles
7.5'		Br	W	Sandy Silt
				Hole Filled in
				Stopped Hole @ 7.5

BY H US Mail DATE 4-11-77

HOLE NO. LINE & STA. OFFSET

SURF. ELEV. G.W. ELEV.

DEPTH	SAMPLE NO.	(1)	(2)	FIELD DESCRIPTION

BY DATE

(1) = PROFILE (2) = MOISTURE (W,M OR D)


DATE:
ILME